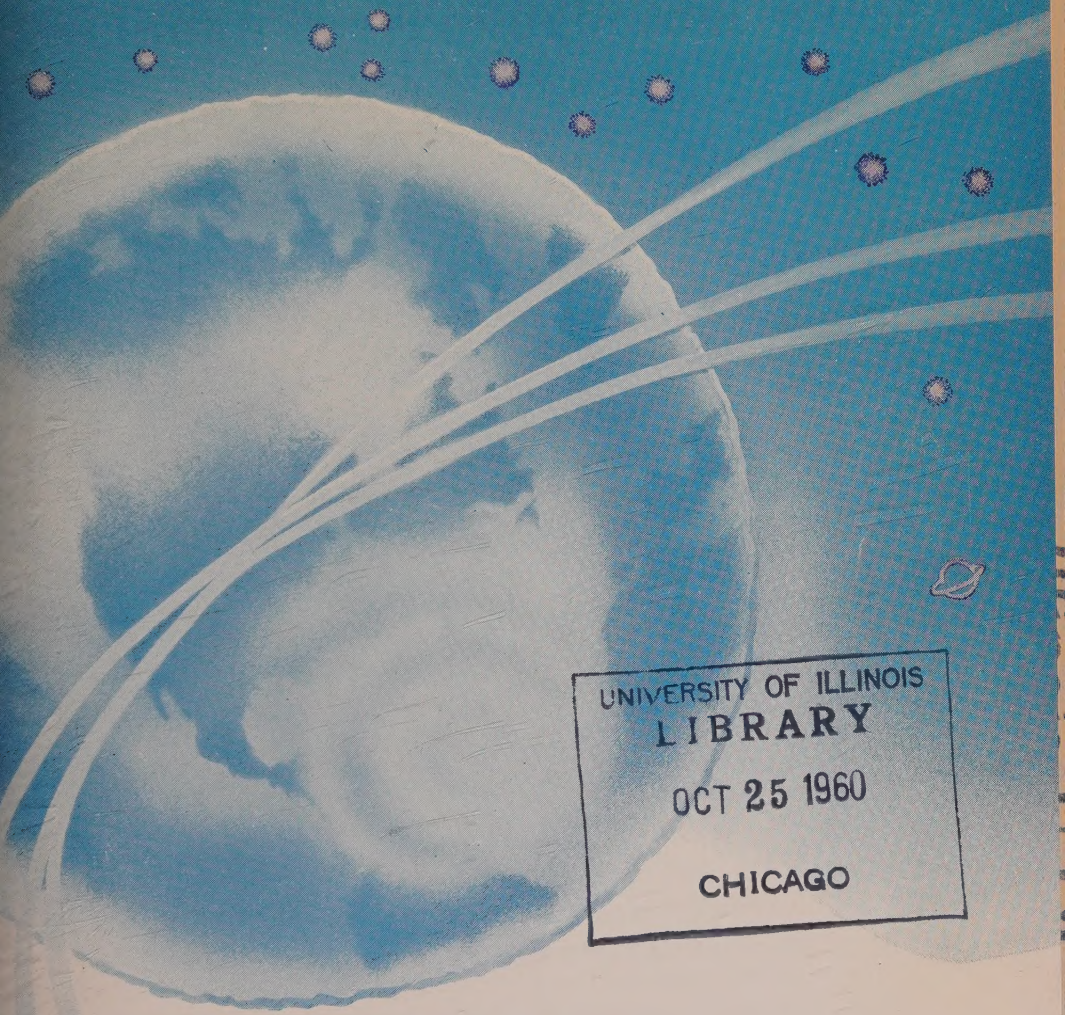
AMERICAN METEOROLOGICAL SOCIETY



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Meteorological & Geoastrophysical ABSTRACTS

Vol. 11 APRIL 1960 No. 4

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 APRIL 1960 No. 4

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AMERICAN METEOROLOGICAL SOCIETY
1919

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Special Feature in This Issue

Bibliography on Physics of the Ionosphere
By
Geza Thuronyi

(*For table of contents see back cover*)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication whose purpose is to bring to the attention of meteorologists, geophysicists and astrophysicists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements	
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)	
7. Albedo	8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere	
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.	
7. Long Range Forecast.	8. Radar Met.	9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)		11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere

Other bibliographies in preparation are:

Airglow	*Forecast Verification*	*Radar Meteorology*
Aurora	*High Atmosphere Temperatures*	*Rocket Meteorology*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will b devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by chart
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for exampl Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modific tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (V 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

A. GENERAL

1. COLLECTIONS, HANDBOOKS AND SYMPOSIA

11.4–1 550.3(02) 523.7

†**Handbuch der Physik, Band 52, Astrophysik III, Das Sonnensystem.** [Encyclopedia of physics, Vol. 52, Astrophysics, Pt. III, The solar system.] Berlin, Springer-Verlag, **1959.** 601 p. 225 figs., tables, refs. at end of most ch., numerous eqs. Subject indexes in German and in English. (All articles abstracted separately. For listing of contents, *see* Pt. III, p. 1777, *MAB.*) **DLC** (QC21.H327), **DWB** (551.03 H236)—This third volume, on astrophysics, contains major review articles summarizing existing knowledge through 1958 and presenting basic data in graphs and tables on the **Solar photosphere** by LEO GOLDBERG and A. K. PIERCE, on the **Structure and dynamics of the solar atmosphere** by CORNELIUS DE JAGER, on the **Atmospheres of the planets by** HAROLD UREY, on **Planetary interiors** by WENDELL C. DEMARCUS, on **Radio echoes from sun, moon and planets** by FRANK J. KERR, on **Comets** by KARL WÜRM and on **Meteors** by FRED L. WHIPPLE. Extensive and detailed subject indexes give, in a straightforward manner, the ideas contained in the contents, not only in words but also in phrases, in English-German and in German-English, thus constituting a two-way glossary as well as index. The chapter on the **Structure and dynamics of the solar atmosphere,** itself, constitutes a textbook (p. 80–362) giving information and data of every aspect of quiet and disturbed photosphere (sunspots, faculae, flares, filaments, prominences, corona, radio emissions, rotation, solar cycle and solar-terrestrial relations). The article on **Planetary atmospheres** covers the Earth, Venus, Mars, Mercury, Moon and other satellites. All articles are in English except the one on **Comets** by K. WÜRM. *Subject Headings:* **1. Handbook of Physics 2. Astrophysics 3. Solar atmosphere 4. Planetary atmospheres 5. Meteors. I. Flügge, S.** (*ed.*).—*M.R.* Ⓢ

11.4–2 551.451(08)

†American Association for the Advancement of Science, **Grasslands: a symposium, N. Y., Dec. 27–30, 1956.** Ed. by Howard B. Sprague. Its *Publication,* No. 53, **1959.** 406 p. numerous figs. and tables. Bibliog. at end of each ch. Price: $9.00. (Pertinent articles abstracted separately.) **DWB** (M86:58 A512gr. Review by Paul B. Sears in *Science,* Wash., D. C., 131(3393):97, Jan. 8, **1960.**—The role which grasslands play and the knowledge relating to them were considered by one of the sections of the Association in 1956. The articles constitute a detailed review of many individual facets of the problem, though it is admitted that some areas are not represented. The articles are grouped into the following 8 sections (each section dealing with one of the important aspects of the subject): Sciences in support of grasslands research, Forage production in temperate humid regions, Engineering aspects of grassland agriculture, Forage utilization and related animal nutrition problems, Evaluation of the nutritive significance of forage, Grassland climatology, Ecology of grasslands and Range management. *Subject Headings:* **1. Grasslands symposia. I. Sprague, Howard B.** (*ed.*).—*I.S.*

11.4–3 551.508.91(08):551.510.42

American Society of Testing Materials, **Symposium on instrumentation in atmospheric analysis.** Presented at a meeting of Committee D-22 on Methods of Atmospheric Sampling and Analysis, A.S.T.M. Boston, Mass., June 23, 1958. Its *ASTM Special Technical Publication,* No. 250, **1959.** 57 p. figs., tables, bibliogs., eqs. Price: $2.25. (All articles abstracted separately.) **DWB** (M10.42 A512sy), **DLC.** Review by R. D. Cadle in *American Meteorological Society, Bulletin,* 41(2):95, Feb. **1960.**—In recent years a large amount of effort

and talent have been directed toward the development of instrumentation to analyze the atmosphere for many different compounds and classes of compounds. The four papers in this Symposium represent a sample of the success that has attended these efforts. The major problems in some of these applications are related to the low concentrations of the pollutant and the difficulty of obtaining sufficient material with which to work. The solution of these problems has been achieved by developing methods of greater collection effectiveness or reaction sensitivity. In the extreme case, O'KONSKI is able to count and classify according to size the individual particles larger than one-fourth micron in an extremely dilute atmospheric aerosol. Similarly, the new spectrographic and chromatographic methods permit the identification of minute quantities of organic compounds. It can be concluded that practically any analytical problem in air pollution is amenable to instrumental solution. The four papers included are: 1) C. T. O'KONSKI et al.: **Light scattering instrumentation for particle size distribution measurements;** 2) M. KATZ and H. P. SANDERSON: **Filtration methods for evaluation of aerosol contaminants;** 3) L. H. ROGERS: **Relative merits of gas chromatography, colorimetry and spectrometry for air pollution studies;** 4) M. D. THOMAS et al.: **An atmospheric fluoride recorder.** *Subject Headings:* **1. Atmospheric analysis instrumentation symposia 2. Atmospheric pollution instruments.**—*I.S.*

11.4–4 621:532.5:551.5(08)

Advances in Applied Mechanics, Vol. 3, pub. N. Y., Academic Press, **1953.** 324 p. figs., refs., eqs. **DLC** (TA350.A4). Review by S. K. Ghaswala in *Science and Culture,* Calcutta 21(1):47, July **1955.**—This volume contains several fundamental papers of interest to meteorologists: I. **Boundary layer problems** by G. F. Carrier (ocean currents, cellular convection, decay of waves, heat transfer in viscous flow); II. **One-dimensional isentropic fluid flow** by Othar Zaldastani (sound propagation, interaction of simple waves, expansion of a gas cloud into a vacuum); III. **Turbulent diffusion:** mean concentration, distribution in a flow field of homogeneous turbulence (point source, line source, molecular diffusion and statistical aspects) by François N. Frenkiel; IV. **On aerodynamics of blasts** (diffraction and reflection around or from objects or walls, respectively) by H. F. Ludloff; V. **On the presence of shocks in mixed subsonic-supersonic flow patterns** by Gottfried Guderley; and several other principal papers of equally high quality. *Subject Headings:* **1. Advances in applied mechanics 2. Turbulent diffusion 3. Blast aerodynamics 4. Fluid mechanics. I. von Mises, Richard** (*ed.*) **II. von Kármán, Theodore** (*ed.*) **III. Frenkiel, F. N.**—*M.R.*

2. TEXTS, BOOKS AND MONOGRAPHS

See also: **Gliding met. texts** (Parczewski), 11.4–36; **Runoff, Armenia** (Valesian), 11.4–188; **Cloud photography** (Conover), 11.4–269.

11.4–5 551.58(02)

†Critchfield, Howard J. (*Bellingham, Wash., Teachers College*), **General climatology** Englewood Cliffs, N. J., Prentice-Hall, **1960.** 465 p. figs., photos, tables, bibliog. p. 431–435 **DLC** (QC981.C73)—An introduction to general (physical, regional and applied) climatology based on years of teaching weather and climate to students at a teachers college. The physical aspects are covered in a nontechnical manner (history, general nature of atmosphere, heat and temp., pressure and winds, moisture, clouds, air masses, storms, forecasting). The climates of the world are treated from the point of view of climatic classifications and regions, zones, etc. (tropical, temperate and polar), while the applications (Pt. III) cover: 1) soil and vegetation, 2) water resources, 3) agriculture, 4) industry, 5) housing, 6) health, 7) cycles and changes. A number of effective and up-to-date illustrations are included, a good list of standard reference works and index appended, and some original approaches to applications incorporated. The illustrative material, graphs, weather maps, etc. are almost all for N. America (snow load data for Canada, heating degree-day data for the U. S., climagraphs, seasonal incidence of infectious diseases in U. S., potential evapotranspiration graphs, etc.), except in the section on climates of the world, which includes representative histograms or graphs and data selections for the various regions discussed. The general tenor of the work is above average for this type of textbook. *Subject Headings:* **1. Climatology textbooks 2. Applied climatology.**—*M.R.*

11.4–6 523.7(02)

Abetti, Giorgio, **The sun.** Transl. by J. B. Sidgwick. London, Faber and Faber, (**1957**). 336 p. 147 plates, 97 figs., tables, 24 refs. Price: 63 sh. Transl. with additional revisions of original Italian, rev. 2d ed. (1950). **DLC** (QB521.A332 1957). Review in *Science Progress*, London, 45(180):709–710, Oct. **1957.**—The first edition (1934) of this pioneer textbook on the sun grew out of an article prepared by the author for the **Handbuch der Astrophysik** in 1929. The second Italian edition (1951) was translated into English with additions by the author to bring it up to date. The most detailed coverage of instruments, methods of observation and results obtained from the beginning of astrophysics during the last half of the 19th century to date, especially in spectroscopy, are included. The 147 photographic plates show in detail the most advanced equipment used in the world, photos of solar eruptions and other features, spectrograms, sunspots, solar observations and radio telescopes. The 97 figures give data and graphical representations of all kinds. A good index is included. The Introduction covers the history of solar study, importance, distance and dimensions of the sun; Ch. I, on observations, goes into visual, photographic and spectrographic methods and equipment; Ch. II—brightness, spots, faculae, rotation and form; III—spectrum of photosphere, limb, spots, chromosphere, flocculi, prominences, filaments, motions, magnetic fields, groups of spots, polarity, hydrogen vortices, etc.; IV—eclipse studies, coronagraphs, flash spectrum, corona; V—physical constitution of the sun, ionization, qualitative analysis of sun, theories of constitution, interior, source of solar energy; VI—radiation and temperature of sun, solar constant, energy distribution, temperature of photosphere and spots; VII—comparison of sun and stars; VIII—terrestrial relations, ionospheric, magnetic, auroral, radio waves and spectrum, meteorological correlation and use of solar heat. (For another abstract from same source, *see* 9B–162, Feb. 1958, *MAB.*) *Subject Headings:* **1. Solar physics textbooks 2. Solar observatories 3. Solar instruments. I. Sidgwick, J. B.** (*transl.*).—*M.R.*

11.4–7 526(02)

*†Heiskanen, Weikko Aleksanteri (*Dir. Inst. of Geodesy, Ohio State Univ. and Finnish Geodetic Inst.*) and Vening Meinesz, F. A. (*Inst. Mineral. Geology and Geophysics, Univ. Utrecht*), **The earth and its gravity field.** N. Y., McGraw-Hill, **1958.** 470 p. numerous figs., tables, eqs. Refs. at end of each ch. Price: $12.50. (*McGraw-Hill Series in the Geological Sciences*, ed. by Robert R. Schrock.) **DLC** (QC815.H4). Review by Serge A. Korff in *Physics Today*, N. Y., 12(5):44–45, May **1959.** Review by Chester R. Longwell in *Amer. Journal of Science*, 275(5):382–383, May **1959. DLC**—A substantial technical text giving basic facts and many details of the broad field of geodesy with emphasis on the gravity field of the earth, the interior structure of the earth (crust, mantle, core and their stresses and strains), the gravity field and theory, formulas, geometry, gravity measurements, historical development of isostasy, physical geodesy, world geodetic systems, derivations from isostatic equilibrium, convection currents in the earth, origin of continents, polar migrations, etc. Many charts, maps, schematic diagrams and tables of data are included, as well as the theory. Excellent reference lists are added to each chapter and a detailed subject and name index appended. *Subject Headings:* **1. Geodesy textbooks 2. Gravity 3. Physical geodesy 4. Polar displacement.**—*M.R.*

11.4–8 91(02)

†Finch, Vernor C.; Trewartha, Glenn T. (*both, Univ. Wisc.*) and Shearer, M. H. (*Westport H.S., Kansas City, Mo.*), **The earth and its resources.** 3d ed. New York, McGraw-Hill Book Company, Inc., **1959.** 584 p. 461 figs., tables, 8 maps (color), refs. at end of each ch. **DWB** (551 F492re), **DLC**—Major sections of this new and nicely illustrated college geography textbook deal with: 1) weather and climate, 2) land forms, 3) oceans and shores, and 4) natural resources. Separate chapters concerning planetary features of the earth, temp., pressure and winds, moisture and precip., storms and weather types, climates of tropics and deserts, climates of middle and high latitudes and several on geomorphology, oceans, water resources, soils, minerals and, finally, regions and resources of the U. S. are included. *Subject Headings:* **1. Geography textbooks 2. Climate and weather.**—*M.R.*

11.4–9 551.5(02

Konor, Yümnü, **Meteoroloji hakkinda unumi bilgiler.** [General principles of meteor ology.] *Turkey, Devlet su Isleri. Umum Müdürlügü Etüd ve Plân Dairesi, Etüd ve Plân lama Rehberi,* No. 320, **1959.** 111 p. numerous figs. and charts (many fold.). **DWI** (M K82me)—A textbook or manual of observation techniques and general meteorology an climatology for students and workers in the Turkish Meteorological Service and schools Pt. I covers General meteorology and atmospheric physics; Pt. II Instruments and observa tions; Pt. III World and local climatology. A major portion of the manual consists of workin tables, charts, and illustrative material of various parts in appendix, lists of stations and thei co-ordinates, statistical correlation charts, flight plans, etc. *Subject Headings:* **1. Meteorolog textbooks 2. Turkish language textbooks 3. Turkey.**—*M.R.*

11.4–10 551.509.33(02

†Kats, Abram L'vovich, **Predskazanie pogody na tri-sem' dneĭ.** [Weather forecasting fo three to seven days.] Leningrad, Gidrometeoizdat, **1958.** 131 p. 32 figs., 65 refs., eqs **DLC** (QC995.K3 1958). First ed. 1950 under title **Prognozy pogody maloĭ zablagovremennosti** This 1958 ed. transl. into English by U. S. Joint Publications Research Service as its *JPRS* 1911-N, Sept. 24, **1959.** Distributed by U. S. Office of Technical Services as its *OTS* 59-13,900 Price: $2.75. (For abstract on original Russian *see* 10.6–11 June 1959 *MAB.*) *Subject Headings:* **1. Extended forecasting textbooks 2. 3–7 day forecasting 3. Soviet forecasting techniques.**

11.4–11 551.509.33(02

†Khrabrov, Iu. B., **Metodika sostavleniia prognozov pogody na 3–7 dneĭ.** [Methods o compiling weather forecasts for 3–7 days.] Moscow, Gidrometeoizdat, **1959.** 182 p. 4 figs., 15 tables+tables in appendix, 100 refs., 3 eqs. **DLC** (QC995.K45). Review by A. A Girs in *Meteorologiia i Gidrologiia,* Leningrad, No. 8:47–50, Aug. **1959.**—A fairly extensive exposition of the techniques used in 3–7 day forecasting by analysis of synoptic processes in the upper planetary frontal zones during natural synoptic periods. The 4 major chapters cover I. History of method (MULTANOVSKIĬ, PAGAVA and others since 1920); II. Evolution of basic processes in synoptic periods; III. Forecasting present and future synoptic periods; IV. Fore casting actual weather elements. Not only statistical (objective) techniques, such as fre quencies of types, movements or trajectories of centers of troughs, ridges, cyclones, etc. but also dynamic computations of vorticity transfer, modification of air masses, etc. are considered Appended are 50 pages of useful tables of changes of mean temp., changes in cloudiness and precip. area during the synoptic period for different types of trajectory of cyclones and of anticyclones in the various months. Many illustrative charts are included. Methods used in Germany (BAUR) and U. S. (NAMIAS) are critically discussed. Verification of the various techniques used is treated. *Subject Headings:* **1. Extended forecasting textbooks 2. 3–7 day forecasting 3. Natural synoptic periods 4. Multanovskiĭ's method.**—*M.R.*

11.4–12 551.5(09) 551.5:8

†Heninger, S. K., Jr., **Handbook of Renaissance meteorology, with particular reference to Elizabethan and Jacobean literature.** Durham, N. C., Duke University, **1960.** 269 p. figs., foot-refs., Index of authorities before 1558, p. 225–240; bibliog., p. 241–248. **DLC** (QC855.H5)—A scholarly and very thorough compilation and critique of medieval literature having reference to or imagery taken from any realm of meteorology (in the Aristotlean sense of the word). Pt. I includes short chapters on (1) the historical background in general (2) the study of meteors before 1558 and (3) the English writing up to 1625 (including transla tion and popular literature), Pt. II contains a section devoted to meteorological theory and its expression in literature (clouds, rain, hail, snow, frost, fog), and others on vapors, exhalations (thunder, lightning, comets, auroras, meteors, winds, earthquakes, and the milky way) reflecting phenomena (sun dogs, halos, rainbows, etc.) and pseudo meteors and related phe nomena (eclipses, springs, tides, metals, chasms, volcanoes and apparitions). Pt. III covers the imagery used by the major creative writers (SPENSER, MARLOWE, BEN JONSON, GEORGE CHAPMAN, JOHN DONNE and, most of all, SHAKESPEARE). Appended are notes on Weathe Prognostication, an Index of Authorities before 1558, a list of editions cited, a select bibli

ography of primary and of secondary sources, a list of passages cited (e.g., from SPENSER and SHAKESPEARE) and a general index. Besides hundreds of citations from Renaissance poetry or prose, there are scores of drawings which are reproduced from woodcuts or other illustrations used by authors or artists of the period to convey their idea of the phenomena. Peculiarly, there is no mention that the several luminous phenomena described quite vividly in Greek and medieval literature cited (e.g., *chasms*) is in reality the Aurora Borealis or Northern Lights (cf. isochasm = iso-auroral line). *Subject Headings:* **1. Renaissance meteorology 2. Meteorology in literature 3. Elizabethan literature 4. History of meteorology.**—*M.R.*

11.4–13 551.577.36(77)

*Barger, Gerald L.; Shaw, Robert H. and Dale, Robert F., **Chances of receiving selected amounts of precipitation in the North Central Region of the United States.** First report to the North Central Regional Technical Committee on Weather Information for Agriculture. Ames, Iowa, Agricultural and Home Economics Experiment Station, Iowa State Univ., July **1959.** 277 p. Almost entirely tables. **DWB** (M77.3 I64ch)—The chances of receiving given amounts of total precipitation during specified periods of time at 125 selected stations in 12 North Central States (Fig. 1) have been computed by fitting the incomplete gamma-distribution to the precipitation totals found in the records. In general, precipitation data for March 1901 through Feb. 1956 have been analyzed. For any given *n*-week frequency distribution, the number of precipitation totals is most often 54, but may reach 61; however, because of missing years or lack of punched card records, some stations have fewer observations, but none has less than 25 years of records. At the beginning of the section for each state, the station names with the station number and the period of record are listed. Combined station records are indicated by multiple names. *Subject Headings:* **1. Precipitation probability 2. Precipitation data 3. North Central States.**—*I.S.*

11.4–14 551.506.3(673) 551.506.7:551.557(673)

*Espírito Santo, Tomaz Rebelo do (*Met. Service of Portugal*), **Resultados das observaçôes meteorológicas (area das explorações da Companhia), anos de 1952 a 1957,** [Results of meteorological observations within the area of exploration of the Companhia de Diamantes de Angola, 1952–1957]. *Companhia de Diamantes de Angola, Lisbon, Publicações Culturais*, No. 44 (Climate of Lunda), issued **1958.** Vol. 1, **Apuramentos anuais da Estacao Meteorologica do Dundo, Postos climatologicos e udometricos** [Annual means of the Dundo Meteorological Station, climatological and udometrical posts]. 307 p. (87 p. of text). 30 figs., numerous tables, 22 refs. Vol. 2, **Apuramentos mensais e valores horarios, Estacao Meteorologica do Dundo** [Monthly means and hourly values of the Dundo Meteorological Station]. 635 p. Vol. 3, **Apuramentos mensais dos postos climatologicos** [Monthly means of the climatological stations], issued **1958.** 235 p. Almost entirely tables. At head of t-p.: Subsidios para aconhecimento do clima da Lunda. **DWB** (M06.1/673 C737re)—Vol. 1 presents an elaborate compilation of data on the climate of Lunda in Angola based on stations maintained by the Angola Diamond Company in Lunda for 1952–1957, incl. The station is described and illustrated, the history of observations in Angola recounted, climatic factors (radiation, circulation in tropics, intertropical convergence, etc.) outlined and illustrated by streamline charts, and the geographical conditions in the region of the Diamond Exploration network of stations, consisting of the Dundo station and 5 climatological stations and 18 rainfall stations, are described in detail. Most of these stations are on a plateau in extreme N. E. Angola at an elevation of 700–1000 m (2300–3300 ft). Data for Dundo are given *in extenso*, and for other stations in summary and frequency tables and in elaborate mean and frequency graphs or histograms. Methods of reduction of data are set forth in detail. Hourly mean or extreme values of pressure, temperature, relative humidity, wind direction and speed, sunshine and precipitation, and daily or 3 times daily evaporation, visibility, clouds, weather, etc. are presented. Winds aloft are given for Dundo for heights up to 10,200 m for 1952–1957 in tables of mean speeds and of frequency of speeds, in 4 or 5 categories and to 8 directions for each month. Graphical presentation of frequencies and averages for Dundo for 1930–57, Andrada, Maludi and Cassanguidi for 1931–57, Chifuto for 1941–55, and Luxilo and Mussolegi for 1937–57 are also presented. The second magnificent volume contains detailed hourly values of pressure, temperature and relative humidity, wind direction and speed, precipitation and daily or 3 times daily values of winds aloft, evaporation,

evapotranspiration, visibility, clouds, sunshine, weather and state of ground. Not only daily but decadal, monthly and annual means, extremes and, in some cases, frequencies are tabulated for each month from Jan. 1952 through Dec. 1957 for Dundo (7°22′S, 20°50′E, 726 m, established 1924), the principal station in the Diamond Exploration network. Vol. 3 contains tables of daily values of the above elements for Andrada, Cassanguidi, Cossa and Maludi for each month from Oct. 1953–Dec. 1957. *Subject Headings:* **1. Climate of Lunda, Angola 2. Upper air wind data, Dundo, Angola 3. Lunda, Angola 4. Dundo, Angola. I. Ferreira, H. Amorim.**—*M.R.*

11.4–15 551.577.2(410)

*Great Britain. Meteorological Office, **Averages of rainfall for Great Britain and Northern Ireland, 1916–1950.** London, Her Majesty's Stationery Office, **1958.** 36 p. mostly tables. **DWB?**—Besides monthly and annual average precipitation for 719 stations well distributed over the U. K., comparisons are shown for 7 stations of monthly and annual averages for 1916–50, 1881–1915, and 1901–30. Tables (and list of stations with coordinates) are arranged by England, Scotland, N. Ireland and Wales with adjacent islands. *Subject Headings:* **1. Precipitation normals for U. K. 2. United Kingdom.**—*M.R.*

3. POPULAR BOOKS, MANUALS AND ATLASES

See also: **Forest climates** (Collins), 11.4–50; **Cooling design data manuals** (Fluor Products Co.), 11.4–65.

11.4–16 591.54:595.7:551.556.4

†Williams, Carrington Bonson, **Insect migration.** London, William Collins, **1958.** 235 p., 49 figs., 16 plates (some colored), 3 tables, bibliog. p. 209–218. **DLC** (QL496.W64). Review by R. C. Rainey in *Nature*, London, 182(4645):1257–1258, Nov. 8, **1958.**—A fascinating book by a renowned entomologist, much of it written while he was chief entomologist at the Rothamsted Experimental Station (1932–55). The various migratory insects (butterflies, locusts, moths and dragonflies are described and beautifully illustrated, and their habits, especially with reference to wind, temperature, rainfall, fronts (inter-tropical front), sea breezes, daylight, elevation, coastlines, etc. are noted. It was found that there is no particular correlation between wind direction and orientation of the flight of insects, though of course the wind does drift the insect appreciably. It is also found that the locusts tend to go toward storm or rain centers. Many flights of monarch butterflies and other species have been seen far at sea (e.g., in the Mediterranean). Layers of Rocky Mountain locusts have been found in glacier formations on peaks at 11,000 ft in Montana, and their age determined by radiocarbon dating as far back as 45 years ±300 years!!! A great many charts and diagrams show movements of locusts, seasonal patterns, orientation and wind roses, etc. The problem of how an insect migrates consistently in one direction and returns has not yet been solved, and the many theories proposed are discussed critically. *Subject Headings:* **1. Insect migration 2. Wind effects on insect migration 3. Locust migration.**—*M.R.*

11.4–17 551.46(09)(261/264)

Outhwaite, Leonard, **The Atlantic: history of an ocean.** N. Y., Coward-McCann, **1957.** 479 p. maps, figs. **DLC** (GC481.08). Review by N. Branskiĭ in *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 91(2):189–191, March/April **1959.** Review by L. Collier in *Geographical Journal*, London, 125(1):116, March **1959.** Review in *Marine Observer*, London, 29(186):201–202, Oct. **1959.**—A popular book glamorizing the Atlantic Ocean from the days of the first sailing vessels to the World War II era. The structural history of the Atlantic, discovery of the Gulf Stream and of the land surrounding the Atlantic, whaling vessels, the slave trade, packets, clippers, oceanography as founded by MATTHEW F. MAURY, practical value of sailing charts, steam navigation, the cable, flying the Atlantic, warfare in Atlantic, submarines, and economic factors in the Atlantic, are discussed from an historical or descriptive standpoint, with a reasonable amount of scientific background. Charts, illustrations, etc., an extensive author-subject index and an annotated guide to literature on the various aspects covered by the text are included. There is considerable irrelevant material, but it is all

interesting and generally accurate. *Subject Headings:* **1. History of oceanography 2. Atlantic. I. Maury, Matthew F.**—*M.R.*

11.4–18 551.578.46(47)

Antimonov, N. A., **Massovye snegomernye s"emki.** [Mass snow gage surveys.] Leningrad, Gidrometeoizdat, **1950.** 46 p. 9 figs., 4 tables. At head of t-p: *Biblioteka Gidrometnabliudatelia.* **DWB** (M08.77 A631ma)—A small informative bulletin giving details of snow measuring networks, equipment, methods of measurement and computation, history of service and network in U.S.S.R., and importance of snow cover in the economy. A few examples of data compilations and applications are given. *Subject Headings:* **1. Snow surveys 2. U.S.S.R.** —*M.R.*

11.4–19 551.578.46/8(472)

*Anisimov, Mikhail Ivanovich, **Sneg i snezhnye obvaly.** [Snow and avalanches.] Moscow, Akademiia Nauk SSSR, **1958.** 98 p. 6 figs., 16 tables, foot-refs. **DLC** (QC929.S7A54) —A standard pamphlet giving information on snow cover, its formation, classification, and physical properties; avalanches and their causes, frequency at different seasons and places, attending phenomena, forecasting and protection. Work based on data obtained by the author in 1933–41 in the Murmansk Oblast while on a railroad assignment at Kirovsk near the southern Khibin Mts., 900–1000 m high and at lat. 67°N. *Subject Headings:* **1. Snow cover 2. Avalanches 3. Kirovsk, Murmansk Oblast, U.S.S.R.**—*M.R.*

11.4–20 551.578.46:551.508.77(78)

Colby, Carroll B., **Snow surveyors: defenders against flood and drought.** New York, Coward-McCann, **1959.** 48 p. numerous photos. **DLC** (QC929.S7C65)—A graphic presentation of snow surveying objectives, methods, equipment and activities in the western U. S., as carried out since 1935 by at least 1000 men, working for and with various U. S. Government agencies (U. S. W. B., Reclamation Service, Forest Service, Soil Conservation Service, Army Engineers, etc.). Among the tools described and illustrated are the Church or Federal Snow Sampler (tube) developed in 1908, the weighing device, the snow gage, soil moisture meter, radioactive snow gage, etc. Hazards, areas of West where surveys are made, and uses in forecasting floods, droughts and water supply are vividly brought out. *Subject Headings:* **1. Snow surveying methods 2. Snow surveying instruments 3. Western U. S.**—*M.R.*

11.4–21 551.5:550.3:061.3

Chappell, Richard Lee, **Antarctic scout.** N. Y., Dodd, Mead, **1959.** 205 p. photos. **DWB** (919.9 C467an) —A vivid account of experiences in the Antarctic as told by the only boy to spend the first year of IGY, Jan.–Dec. 1957, at Little America V. Dick Chappell, 18 years old of Eggertsville, N. Y., was chosen from thousands of Explorer Scouts, as being most representative of the American boy. He graduated from high school the month he was selected to go to the Antarctic. A preface by Paul Siple, Director of Polar Affairs, tells how he himself had been in the same situation 28 yrs ago when he went on Byrd's first expedition. The account gives some details of scientific activity engaged in by the author as a junior scientific aide to the U. S. IGY scientists. On the return trip he visited the Russian base at Mirny and attended an Antarctic symposium at Wellington, New Zealand in Feb. 1958. He spent 2 weeks in Dec. 1957 at Camp Michigan with a glaciological party. *Subject Headings:* **1. IGY Antarctic activities 2. Little America, Antarctica.**—*M.R.*

11.4–22 551.46(023)

Fisher, James, **Wonderful world of the sea.** Garden City, N. Y., Garden City Books, **1957.** 69 p. illus. Price: $2.95. **DLC** (GC21.F5)—A vividly graphic, imaginative, and highly colored collection of pictures and drawings including a description of the sea from its origin, structure, topography, circulation and its causes to tides, tidal and volcanic waves and disturbances, history, life, uses in peace and war, navigation, exploration, commerce, protection of shipping, resorts, scientific expeditions since Cook (1768), soundings, oceanographic laboratories, use of flora and chemicals, reclamation, bathyscaphes and benthoscopes, etc. *Subject Heading:* **1. Popular oceanography.**—*M.R.*

4. IGY, ORGANIZATIONS AND CONFERENCES

See also: **IGY Antarctic activities** (Chappell), 11.4–21; **Agromet. conf.** (Bannister), 11.4–49, **IGY auroral program** (Barbier), 11.4–107; **IGY auroral program** (Gartlein), 11.4–109; **IGY aurora program, Poland** (Kosibowa), 11.4–115; **IGY auroral program** (Landolt), 11.4–125; **Soviet participation in IGY** (Fesenkov), 11.4–140; **WMO Synoptic Met. Commission** (Veranneman), 11.4–213.

11.4–23 551.5:91.04(99) 551.524.36(99)

Alt, J., **Les expéditions antarctiques américaines pendant l'Année Géophysique.** [U. S. Antarctic expeditions during the IGY.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctiques Françaises*, No. 7:15–28, April/June **1959.** 2 figs., 10 photos. **DLC**—A brief geographic description is given of the Antarctic continent, and the 4 Operations Deep Freeze, carried out from 1955 to 1959, are outlined. A general idea is given of the means utilized, the scientific program and the principal instruments of the various American bases in the Antarctic. The author mentions the temperature of −87°C, observed in August 1958 at the Russian station Sovetskaia, situated at an altitude of 3500 m, which has to be considered as the lowest temperature ever recorded at the earth's surface. *Subject Headings:* **1. IGY U. S. Antarctic expeditions 2. IGY Antarctic stations 3. Operation Deep Freeze 4. Absolute minimum temperatures.**—*A. V.*

11.4–24 551.5:91.04(99)

Tolstikov, M., **Les stations soviétiques dans l'Antarctique.** [Soviet stations in Antarctica.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctiques Françaises*, Paris, No. 7:29–36, April/June **1959.** 5 photos. **DLC**—Six Soviet stations have been installed and are in operation in the Antarctic, as part of the IGY program. A review is given of the scientific equipment and of the observation program of each station. *Subject Headings:* **1. Soviet IGY Antarctic stations 2. Soviet participation in IGY 3. Antarctica.** —*A. V.*

11.4–25 551.5:91.04(99)

Victor, Paul-Emile, **Les Expéditions Françaises en Terre Adélie.** [French expeditions in Adélie Land.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctiques Françaises*, Paris, No. 7:3–14, April/June **1959.** 6 figs. **DLC**—Historical account of the French expeditions in Adélie Land. The author comments on the expeditions relating to three distinct periods: 1949–1953; 1955–1958 and 1958–1960. He gives the aims and programs of the various expeditions and details the results obtained by each. *Subject Headings:* **1. French Antarctic expeditions 2. Adélie Land, Antarctica.**—*A. V.*

11.4–26 550.3:551.506.22

Veldkamp, J., **Nieuws van het Geofysische Jaar VIII.** [News of the Geophysical Year, Pt. 8.] *Hemel en Dampkring*, The Hague, 57(7/8):169–171, July/August, **1959. DWB, DLC** —Some remarkable results are given concerning: 1) ionospheric research at Halley Bay (Antarctica); 2) the solar eclipse of Oct. 12, 1958 observed by the American expedition in the Danger Islands; 3) the discovery of coal in the Horlick Mts.; and 4) the American interplanetary rockets Pioneer I and III. *Subject Heading:* **1. IGY data.**—*A. V.*

11.4–27 550.3:551.506.22:378.4(45)

Bossolasco, Mario, **L'attività svolta dall'Istituto Geofisico dell'Università di Genova nel quadro dell'Anno Geofisico Internazionale 1957–1958.** [Activities of the Geophysical Institute of the University of Genoa during the IGY, 1957–1958.] *Geofisica e Meteorologia*, Genoa, 7(1/2):13–26, Jan./April **1959.** 12 figs., 8 refs. **DWB**—The observatories and stations belonging to the Geophysical Institute of Genoa University, active during the IGY 1957–1958, are first described. They are: meteorological observatory of Genoa University; seismological station in Genoa; marine station in Genoa-Pra; station in Vesima (Arenzano) and observatory of Mt. Capellino; further, in collaboration with other institutions, the marine station of Leghorn and the meteorological station of Sauze d'Ouix (Turin). The main series of the observations, particularly those related to definite research, are briefly outlined, for the following

fields: meteorology, geomagnetism and earth-currents, ionosphere, marine physics and seismology. Finally, the very difficult situation in which these activities have been carried out is emphasized. *Subject Headings:* **1. Geophysical institutes 2. Italian participation in IGY.**—*Author's abstract.*

11.4–28 551.593:378:061.3(47)

Rasshirennaia otchetnaia sessiia uchenogo soveta Instituta fiziki atmosfery AN SSSR. [Expanded reporting session of the Scientific Council of the Institute of Atmospheric Physics of the Academy of Sciences of the U.S.S.R.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 10:1262–1263, Oct. **1958. DLC**—The expanded reporting session of the Council of the Institute of Atmospheric Physics of the Academy of Sciences of the U.S.S.R. was held March 3–5, 1958. The sessions were devoted to problems of atmospheric optics. Brief summaries are presented of the papers which included the following: **Investigation of the optical properties of the atmosphere** by G. V. Rozenberg; **Some problems of the theory of transport of radiation in the atmosphere in the presence of horizontal inhomogeneities** by M. S. Malkevich; **Results of theoretical investigations of the cooling of upper parts of clouds** by E. M. Feĭgel'son; **Results of preliminary studies of the polarization index of scattering** by G. V. Rozenberg, N. D. Rudometkina and I. M. Mikhailin; **Results of the atmospheric optics expedition of 1957** by A. Ia. Driving and N. V. Zolotavina; **Small oscillations of the atmosphere and the general formulation of the adaptation problems** by A. S. Monin and A. M. Obukhov; **Experimental investigations of the penetration of a light source at the earth's surface** by V. I. Tatarskiĭ, A. S. Gurvich and L. P. Tsvang, etc. *Subject Headings:* **1. Atmospheric optics conferences 2. U.S.S.R.**—*I.L.D.*

5. EDUCATION, HISTORY, BIOGRAPHY, ETC.

History

See also: **Renaissance met.** (Heninger), 11.4–12; **Hist. of oceanog., Atlantic** (Outhwaite), 11.4–17.

11.4–29 551.5(73)(09)

Schloemer, R. W. (*Office of Climatology*), **Climatology: a warehouse of knowledge.** Wash., D. C., U. S. Weather Bureau, Jan. 30, **1959.** 8 p. 13 figs. Mimeo. **DWB** (M8 U587c)—This article discusses the inventories of weather observation in the U. S. since the days of Thomas Jefferson. Recent advances in the storage of early records, modern methods of data processing, checking, summarization, printing, the punched card system and the inside story of many climatological elements are given. There are about 11,000 stations where 24-hourly and daily maximum and minimum temperature and precipitation observations are taken. Upper air soundings, conducted at about 90 stations, are placed on cards. About 30,000,000 punched cards have been accumulated. *Subject Headings:* **1. Climatology 2. Historic weather records 3. United States.**—*N.N.*

Biography

11.4–30 551.5:629.13:92

The Robert M. Losey award to Patrick D. McTaggart-Cowan, Associate Director, Canadian Meteorological Service, Air Service Branch, Department of Transport, Canada. *Aero/Space Engineering*, N. Y., 18(3):36, March **1959.** photo. **DLC**—The Robert M. Losey award honors a meteorological officer who was killed at Dombas, Norway, April 21, 1940 while serving as an observer for the U. S. Army, and thus was the first U. S. officer to die in World War II. The award was "In recognition of outstanding contributions to the science of meteorology as applied to aeronautics." McTaggart-Cowan was born in Edinburgh, Scotland in 1912 and graduated from the Univ. of British Columbia in 1933. He was honored for his wartime forecasting and advice to the North Atlantic RAF Ferry Command and for publications concerning operations on N. Atlantic. His 1942 **Instructions** became foundation for later ICAO "procedures." *Subject Headings:* **1. Robert M. Losey Award 2. Biography of Patrick D. McTaggart-Cowan 3. McTaggart-Cowan, P. D.**—*M.R.*

11.4–31 551.5:92

Wadati, Kiyoo (*Dir.-Genl., Japan Met. Agency, Tokyo*), **In Memory of Prof. Dr. Takematsu Okada (biographical sketch).** *Geophysical Magazine*, Tokyo, 28(3, Pt. 1):241–247, March **1958.** Also: **Works of Dr. T. Okada,** *Ibid.*, p. 249–259. **DLC**—Takematsu Okada, the fourth Director of the Central Meteorological Observatory of Japan was born on Aug. 17, 1874 and died on Sept. 2, 1956. Under his directorship the meteorological service showed remarkable developments such as the consolidation of weather stations on islands, capes and mountains; the establishment of meteorological stations for agriculture and air navigation; the promotion of upper air observations, etc. The number of his original papers is more than 100, and deal with the most varying meteorological and geophysical subjects. Among his best-known works are his study on the Bai-u season in Japan and the **Climate of Japan.** He was a pioneer of long range forecasts in Japan; the most important law of the motion of cyclones and anticyclones under mutual influences was discovered by him and known as Okada's Law. A chronological list of his papers (classified per review) and books is given. *Subject Headings:* **1. Obituary of Takematsu Okada 2. Okada, Takematsu.**—*A. V.*

B. APPLICATIONS

1. AERONAUTICS

See also: **Airport visibility, Paris-Orly Airport** (Serpolay), 11.4–216; **Orographic waves, Latium** (Ferrari), 11.4–259; **Air route forecasting, Greenland** (Carpenter), 11.4–270; **Ionization effects on airplanes** (Corbillon), 11.4–302.

11.4–32 551.591.3:551.576.3:656.71

Guss, Hans, **Sichtweite und Bewölkung an deutschen Verkehrsflughäfen.** [Visibility and cloudiness at German commercial airports.] *Germany. Deutscher Wetterdienst, Berichte*, 7(52):**1959.** 7 p. 7 figs., 3 tables, 8 refs. German and English summaries p. 3. **DWB, DLC**—Following WMO and ICAO recommendations, ceiling and visibility statistics based on 3-hourly observations for 1949–54 are given for airports at Berlin, Hamburg, Hannover, Düsseldorf, Cologne, Frankfurt a.M., Stuttgart, and Munich. Included are frequencies of simultaneous ceilings and visibilities (full array of class intervals) at each of the hours 00, 06, 12, 18 G.M.T., and for each of the months October through March. For all months of the year, values of selected limits of visibility ($<\frac{1}{2}$, 1, 3 mi) and ceiling ($<$200, 500, 1000 ft), but tabulated independently, are given for each of the hours 00, 03 . . . 21 G.M.T. and for all hours combined. Some of the above statistics are also shown in graphs which highlight diurnal variations, particularly with respect to times of sunrise and sunset. Note that various related climatological statistics were presented earlier in the same series of reports, Vol. 3, No. 21, **1956** (*see* 7.11–71, Nov. 1956, *MAB*). *Subject Headings:* **1. Ceiling and visibility data 2. Airport meteorological data 3. Germany.**—*R. S. Quiroz.*

11.4–33 551.589.5:656.71(480)

*Venho, S. N., **A study of the aeronautical meteorological conditions at Kemi Airport.** *Finland. Ilmatieteellinen Keskuslaitos, Toimituksia*, No. 44, **1957.** 19 p. 10 tables. **DWB, DLC**—Regular 3-hourly observations of the distributions of wind, visibility and ceiling, hydrometeors, and temperature at Kemi Airport, North Finland (65°47′N, 24°35′E; elevation 10 m), were made between Dec. 1, 1946 and Nov. 30, 1956. A summary of the results of observation is presented. *Subject Headings:* **1. Aeronautical meteorology 2. Airport meteorological data 3. Kemi Airport, Finland.**—*N.N.*

11.4–34 551.506.3:551.582.2(624):656.71

*Bhalotra, Y. P. R., **Adverse weather conditions at Khartoum, El Obeid and Wadi Halfa.** *Sudan. Meteorological Service, Memoir*, No. 2, March **1959.** 112 p. 27 figs., map, 36 tables +tables in appendix. **DWB** (M(055) S943me)—Weather records obtained during 1953–1957 at the main airport at Khartoum and at the two alternate airdromes, El Obeid (lat. 13°10′N, long. 30°14′E) and Wadi Halfa (lat. 21°50′N, long. 31°18′E), were statistically treated for

frequency and intensity of weather conditions detrimental to trafficability. It was found that such weather conditions are rarely encountered simultaneously at the three airports and that Wadi Halfa is the most favorable alternate. The statistical data presented in tabular and graphical form comprise: visibility (dust/sand storms), thunderstorms, squalls and cloudiness. *Subject Headings:* **1. Airport meteorological data 2. Sudan.**—*W.N.*

11.4–35 551.551:629.13

Etkin, B. (*Prof. of Aero. Eng. and Res. Assoc., Inst. of Aerophysics, Univ. of Toronto*), **A theory of the response of airplanes to random atmospheric turbulence.** *Journal of the Aero/Space Sciences*, N. Y., 26(7):409–420, July **1959.** 20 figs., graph, 4 tables, 7 refs., 9 eqs. **DWB, DLC**—A theory is given for the aerodynamic forces and moments which act on an airplane as a result of flight through turbulent air, and for the associated dynamic response of the airplane. It starts with Ribner's spectral theory of the phenomenon, and extends it to a specific formulation of the forces and moments. This is achieved by expanding the downwash field of a single spectral component in a power series in the neighborhood of the airplane. Spanwise variations of the gust intensity are included, and the wing can be treated by an applicable lifting line or surface theory. The final expressions give the forces and moments in terms of a set of aerodynamic derivatives like those used in a stability and flutter analysis. Consideration of the equations of motion, and the airplane transfer functions, shows that the final response quantities of interest can be obtained in the form of one-dimensional power spectra. Tables and graphs of the relevant input spectra are given. *Subject Heading:* **1. Turbulence effects on airplanes.**—*Author's abstract.*

11.4–36 551.5:629.135.15(023)

Parczewski, Władysław, **Planeristu o volnovykh dvizheniiakh v atmosfere.** [For glider pilots: wave motions in the atmosphere.] Moscow, Izdatvo Dosaaf, **1957.** 57 p. 26 figs., 28 photos, 4 tables. "Transl. from Polish." At head of t-p.: Vladislav Parchevskiĭ. On wave motions in the atmosphere; for glider pilots. **DWB** (M:629.13 P225pL)—An original, but not too technical, monograph or bulletin giving information on mountain and other types of atmospheric waves, wave clouds, convective clouds and their application to gliding. All types of wave motion (long and short waves, gravitation waves, föhn waves, stationary waves, free waves) are discussed and illustrated schematically, and soundings during strong föhn wave conditions (near Elena Gury, Dec. 8, 1951) giving temperature at each level to 13,000 m, vertical velocities, cloud formations, inversions, wave structure, etc. are included. Some actual data on vertical velocities in other instances, synoptic weather conditions during föhn, techniques of soaring on waves and thermals, flying from one wave to another and, finally, numerous wave or convective cloud pictures pertinent to gliding are discussed or presented. *Subject Headings:* **1. Gliding meteorology textbook 2. Mountain waves 3. Poland.**—*M.R.*

2. AGRICULTURE

See also: **Grasslands symposia,** 11.4–2; **CO_2 surges in leaves** (Decker, Wien), 11.4–51; **Day length effect on spinach** (Verkerk), 11.4–245; **Frost protection** (Jenny), 11.4–251; **Frost damage prevention** (Jenny), 11.4–252; **Potential evapotranspiration** (Garnier), 11.4–262; **Cultivation in drained marshes, Ituri** (Van Parys), 11.4–294; **Temp. effects on groundnuts** (Bolhuis, De Groot), 11.4–297.

11.4–37 551.586:551.573:633.3

†de Wit, C. T., **Transpiration and crop yields.** *Wageningen. Centraal Instituut voor Landbouwkundig Onderzoek, Verslagen van Landbouwkundige Onderzoekingen*, No. 64(6), **1958.** 88 p., 47 figs., 14 tables, 82 refs. Text in English and in Dutch. Each chapter summarized. **DLC, DA**—It is shown in this paper that the relation between transpiration and total dry matter production of plants in containers is much less affected by the growing conditions than supposed. In the semi-arid and arid regions of the U. S. this relation appears to depend mainly on plant species and free water evaporation. In cloudy regions, such as the Netherlands, it depends mainly on plant species only. The effect of factors like soil fertility and availability of water appears to be of secondary importance, except in extreme conditions,

This difference between these two climatic regions is due to light intensity. In cloudy climates assimilation is much more limited by light intensity than in climates with a large percentage of bright sunshine. It is shown that the relation between transpiration and total dry matter production of plants under field conditions must often be the same as for plants in containers, provided the dry matter production of the plants in the field is limited by the availability of water. Where this latter is not the case, transpiration tends to be higher. Difficulties were met in dealing with the interrelation between drought resistance and transpiration-production relations and with the contribution of advective energy to transpiration. As for drought resistance, it is shown that the relation between transpiration and total dry matter production is not affected by the ability of the plant to withstand periods of drought. Instead, the amount of marketable products and the total amount of water which is transpired during the growing period, may depend to a large extent on this ability. Even when transpiration was considerably larger than free water evaporation, it appeared that the relation between transpiration and production in the field was often the same as in containters. It is concluded that in the fields, advective energy may supply a considerable amount of the heat necessary to vaporize the water which is transpired. On the other hand, it appeared that there must be and are fields where this is not the case. In those fields, transpiration may be lower than the transpiration calculated with production-transpiration equations in containers. A quantitative treatment of the relation between transpiration and production under these conditions is not attempted, because of the complexity of the aerodynamic approach. *Subject Headings:* **1. Agricultural meteorology 2. Transpiration and crop yield 3. Light intensity influences.**—*Author's abstract.*

11.4–38 551.524.37:632.111:634.8

Kurz, J., **Erfolgreiche Spätfrostbekämpfung mit Briketts in Rebberg.** [Successful action against late frost in vineyard by means of briquettes.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(9):240–242, May 3, **1958.** **DA**—During recent years, late frost caused important damage to vineyards. The author mentions and criticizes the different methods of protection against frost (irrigation, oil fires, briquettes and smoke producing methods). The briquette method is especially studied and is recommended for small areas. Experiments with this method were made in 1954 and 1957. There follows a comment about the disposition of the fires and the description of the very efficient results obtained during the frost on May 7th, 1957. A view of the costs is given and advantages as well as disadvantages of this system are mentioned. *Subject Headings:* **1. Spring frosts 2. Frost protection of vineyards.**—*A. V.*

11.4–39 551.524.37:632.111:634.8

Schellenberg, A., **Der Frostschutz im Weinbau mit Strohschirmen.** [Protection of vineyards against frost with straw screens.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(8):205–211, April 19, **1958.** 4 photos. **DA**—Experiments made in Zurich canton during the last 30 yrs. The straw screens protect the plants against rime formation; the purely thermal effect being secondary. The author discusses some influences: quality of the straw, soil condition, developmental stage of the vines, time of placing and removal of the screens, meteorological factors (wind, temperature, fog, etc). Precise indications about the benefit of this protection method, that can be combined with other methods, are given. *Subject Headings:* **1. Spring frosts 2. Frost protection of vineyards 3. Switzerland.**—*A. V.*

11.4–40 551.508.2:551.524.37:632.111

Peyer, E., **Erfahrungen und Untersuchungen mit der Frostschutzberegnung in der Ostschweiz im Jahre 1957.** [Experiments and investigations on frost protection by sprinkling in eastern Switzerland during 1957.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(3):83–102, Feb. 8, **1958.** 12 figs. **DA**—The paper is divided into 4 parts. First the author treats of the late frost in 1957 in N.E. Switzerland and of the irrigation effect on vineyards. He reviews the experiments made in eastern Switzerland during 1957. The second part (METRAUX, J. M.) comments on the measurement of the water quantity used by the instruments. The third part (GMÜR, V.) gives instructions for construction and application

of the instruments and, finally, the fourth part treats of the measurement of temperature (KUHN, W.). *Subject Headings:* **1. Late spring frosts 2. Frost prevention by irrigation 3. Temperature instruments 4. Switzerland.**—*A. V.*

11.4–41 551.524.37:632.111

Stahel, M., **Erfahrungen in der Spätfrostbekämpfung im Früjahr 1957 in einer Obstanlage.** [Experiments on protection against late frost made in an orchard during the spring of 1957.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(1):12–16, Jan. 11, **1958.** 3 figs. **DA**—Frost during the spring of 1957 made it possible to obtain some results on protection methods against frost and their efficiency. At the time, two methods were utilized: irrigation and fires. These two methods have some advantages as well as some disadvantages; the irrigation method can be improved but installation is expensive. *Subject Headings:* **1. Spring frosts 2. Frost protection of orchards.**—*A. V.*

11.4–42 551.524.37:632.111

Montandon, F., **Le froid du mois de férvier 1956.** [Cold weather during February 1956.] *Revue pour l'Étude des Calamités*, Geneva, 16(34/35):64–70, **1957. DLC**—The author reviews the effects of cold weather during February 1956 in France. The cold wave of 1879/80 caused lower temperatures in Paris, but was scarcely observed in the south of France. In February 1956, the absence of snow cover aggravated damage to cereals and low growing crops. Besides damage to crops there was also human injury, freezing of navigable rivers, etc. Conclusions for insurance companies. *Subject Headings:* **1. Hard frost, France (Feb. 1956) 2. Frost damage to crops 3. France.**—*A. V.*

11.4–43 551.524.372:633

*Yamanaka, K. (*Central Met. Observatory, Japan*), **Estimation of the frost damage on crops. Japan.** *Meteorological Agency, Tokyo, Memoirs of Industrial Meteorology*, 19(2)77–80, March **1956.** 3 figs., table. In Japanese; English summary p. 80. **DWB, DLC**—Considering that the weather damage to crops is dependent upon weather conditions and growing stages of crops, the author has made an estimation of the damage by the following methods: 1) growing conditions at various stages of wheat are estimated by effective accumulated temperatures (>3°C), as shown in Fig. 1, and 2) the relations between the minimum air temperature and the occurrence of damage are analyzed for various growing stages, as shown in Fig. 2. Using the above method, a prediction is made of the districts where damage to wheat crops might occur, from the data of daily minimum air temperature. These estimated districts coincide with the districts where the damage actually occurred, as shown in Fig. 3. *Subject Headings:* **1. Frost damage to crops 2. Wheat 3. Japan.**—*Author's abstract.*

11.4–44 551.524.371:634

Peyer, E., **Demonstration der Frostbekämpfung im Obst- und Weinbau.** [Demonstration of action against frost in arboriculture and viticulture.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(10):262–264, May 17, **1958. DA**—Report on the experiments organized by the Valais station of the Federal Experimental Agricultural Stations, with the financial co-operation of Valais canton. Many systems of irrigation and heating were installed on a total surface of 7 ha. Experiments have been made on the technical properties and the efficiency of each system. *Subject Headings:* **1. Spring frosts 2. Frost protection methods 3. Switzerland.**—*A. V.*

11.4–45 551.524.371:551.586:634.8

Schellenberg, A., **Tätigkeitsbericht des Schweizerischen Weinbauvereins für das Jahr 1957.** [Report on the activity of the Swiss Viticultural Society for 1957.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswill, 67(6):165–167, March 22, **1958** and 67(7):190–192, April 5, **1958.** 4 tables. **DA**—The paper contains some information about the frost on May 8, 1957 and its effects. Tables give temperatures and precipitation during the growing period. *Subject Headings:* **1. Late spring frosts 2. Viticulture.**—*A. V.*

11.4–46 551.586:633.18(52

Yanagiya, K., **Weather and the rice crop in Aomori Prefecture in 1957.** *Japan. Meteorological Agency. Tokyo, Memoirs of Industrial Meteorology*, 22(1):1–8, **1958.** fig., 5 tables In Japanese; English summary p. 7–8. **DLC.** Reprinted in *Sendai, Japan. Central Meteorological Observatory, Journal of Meteorological Research of Tohoku District*, Vol. 12, Memoi No. 8, March **1959. DWB**—Important features of the relation between weather and rice cro in Aomori Pref. in 1957 are as follows: 1) Though the weather conditions were very bad, th rice crop exceeded the normal crop. 2) However, in some areas where the weather condition were relatively good and the technique of culture was at high level, rice plants did not ripe remarkably. The author has investigated the causes of these phenomena. For the forme phenomenon, the following considerations may be cited: (a) though the weather was unseason able, no extremely low temperatures occurred, and the rice plants were not injured in thei important stage of growth; (b) owing to weather conditions unsuitable for the outbreak of th so-called "imochi" disease, and to the countermeasures for prevention of the disease, th occurrence of the disease was very rare in this year; (c) high temperatures were brought b Typhoon No. 7 ("Agnes") in the last decade of August (most important period for the crop) The latter phenomenon is attributable to the fact that in the said areas the growth of the ric plants developed so rapidly that the important stage of growth coincided with the period of lo temperatures and cloudy days before the second decade of August. Adequate counter measures for such problems are as follows: (a) Selection of cold-proof species of rice plant (b) Hastening the growth of the rice plant. *Subject Headings:* **1. Rice crops 2. Weathe effects on rice yield 3. Aomori Prefecture, Japan.**—*Author's summary.*

11.4–47 551.501.4:551.525:536.2

Bayerle, Bohumil, **Theoretické řešení promrzání zeminy.** [Theoretical treatment of th freezing of soil.] *Meteorologické Zprávy*, Prague, 10(3):72–76, **1957.** fig., 2 tables, 7 refs. 9 eqs. Russian and English summaries p. 72–73. **DWB**—From the general equations of hea conduction in solids, specific expressions are derived for the depth of soil freezing with o without snow cover. Numerical values are obtained for different types of soil. Calculate depths of freezing are in good agreement with measured depths. *Subject Headings:* **1. Soi freezing calculations 2. Soil heat conductivity.**—*G.T.*

11.4–48 551.311:551.58

Kayser, Bernard, **La science du sol: lithologie et climat dans la pédogénèse tropicale** [Soil science: lithology and climate in tropical pedogenesis.] *Annales de Géographie*, Paris 67(364):542–543, Nov./Dec. **1958. DLC**—Processes of rock weathering and soil formation in the tropics owe their peculiarities to the conditions of hydrolysis at high temperatures. By means of two examples taken from two studies headed **Les sols de l'Indonésie** [Soils of In donesia] and **Les sols de l'Union Sud-Africaine** [The soils of the South African Union] author shows that the bedrock is no less important in the tropics than in the temperate zone Geographical distribution of the four principal classes of Indonesian soils seems to be rule by the lithologic factor rather than the climatic factor. In the Union of South Africa, th amount of rainfall—together with the very high temperature prevailing during the rainy months—plays a decisive part in the state of decomposition of clayey minerals in the soil but nature of the bedrock can be the cause of essential differentiations. *Subject Headings* **1. Tropical pedogenesis 2. Climatic influences on soil formation.**—*A.V.*

11.4–49 551.5:63:061.

Bannister, U. M., **Second session of the Commission for Agricultural Meteorology** *World Meteorological Organization, WMO Bulletin*, 8(1):9–13, Jan. **1959. DWB**—Account o meeting in Warsaw presided over by J. J. Burgos of Argentina, president of Commission fo Agricultural Meteorology. Representatives of 33 WMO members and 3 international organ izations attended. P. M. A. Bourke of Ireland was elected president and M. S. Kulek of U.S.S.R. as vice-president. A 4-day excursion to study Forest and Agricultural Research Projects, and an exhibition of maps, photos and instruments of interest to Commission wer arranged. *Subject Headings:* **1. Agrometeorological conferences 2. WMO. Agricultura Meteorology Commission.**—*M.R.*

3. FORESTRY

See also: **Wind effects on forest fires** (Whittingham), 11.4–258; **Forest microclimat.** (Pruitt), **11.4–298.**

11.4–50 551.588.6:634.92

†Collins, William Bernard (*Deputy Chief Conservator of Forests, Ghana*), **The perpetual forest.** Phil., Lippincott, **1959.** 288 p. bibliog. p. 273–274. Price: $4.50. **DLC** (QK938.F6C6). Review by W. J. Beecher in *Science*, Wash., D. C., 129(3364):1669, June 19, **1959.**—A popular book on forests and forest environments, animals, insects, birds, plants, climate, temperatures, etc. *Subject Headings:* **1. Forests 2. Forest climates.**—*M. R.*

11.4–51 551.521.3:546.264

Decker, John P. and Wien, Janet D. (*Rocky Mtn. Forest & Range Exper. Stn.*), **Carbon dioxide surges in green leaves.** *Solar Energy: the Journal of Solar Energy Science and Engineering*, Phoenix, 2(1):39–41, Jan. **1958.** 3 figs., 2 tables, 5 refs. **DWB**—CO_2 concentration of a fixed volume of air surrounding a eucalyptus leaf was measured continuously by an infrared gas analyzer while the leaf was alternately illuminated and darkened. A brief insurge of CO_2 was recorded during the initial few seconds of illumination, and a matching outsurge when the leaf was darkened. The surges appear to result from lags between rate changes of photosynthesis and respiration. *Subject Headings:* **1. Carbon dioxide surges in leaves 2. Carbon dioxide absorption by leaves 3. Photosynthesis.**—*Authors' abstract.*

11.4–52 551.521.1:551.584.41:551.586(234.3)

*†Turner, Hans, **Über das Licht- und Strahlungsklima einer Hanglage der Ötztaler Alpen bei Obergurgl und seine Auswirkung auf das Mikroklima und auf die Vegetation.** [Light and radiation climate of a slope site in the Ötztaler Alps at Obergurgl and its effect on microclimate and vegetation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 8(3/4):273–325, **1958.** 16 figs., 18 tables, 27 refs. **DLC**—During the period May 25–Nov. 13, 1953, the author conducted measurements in global radiation including solar and sky radiation, and total illumination in a glade of a stone-pine and larch forest just below the upper tree trunk at 1940 m altitude in the Ötztal. During the same period similar radiation measurements were made within stands of stone-pine and larch and the dependence of soil and plant temperatures upon radiation and the albedo of the principal plant associations were investigated. The experimental station in the natural forest and mountain horizon and of the instrumentation and procedure are described with photographs and a diagram. The results of the measurements presented in graphs and tables include the following: effective and actual sunshine duration, radiation from sun and sky for a cloud-free sky, for a cloud-covered sky and for varying sky cover, mean values and totals of global radiation during actual cloud conditions; illumination by sun and sky and its relationship to global radiation; bioclimatic measurements including radiation and soil temperature, daily variations of soil temperature as a function of daily total of global radiation, examples of the relationships between incoming radiation upon surface parallel to the slope and soil temperature at a depth of one centimeter for various kinds of stands, the dependence of the stone-pine needle temperature near the ground upon radiation, the radiation conditions within a mountain forest (stone-pine forest), radiation climatic cross-section through a clearing in the experimental area and the albedo of a number of plant associations. *Subject Headings:* **1. Radiation climatology 2. Global radiation on slopes 3. Forest radiation 4. Ötztaler Alps, Austria.**—*I.L.D.*

11.4–53 551.588.6:551.49

Leyton, L. and Carlisle, A. (*Imperial Forestry Inst., Oxford Univ.*), **Afforestation and water supplies in Britain.** *Switzerland. Anstalt für das Forstliche Versuchswesen, Mitteilungen*, 35(1):51–56, **1959.** 2 figs., 10 refs. German, French and Italian summaries p. 55–56. **DLC**—Scarcity of water is a serious problem in large areas of England and Wales. The role of afforestation on water balance has given rise to a controversy. From the first investigations it was concluded that afforestation had an unfavorable influence on water regime, but recent research has proved the favorable influence of afforestation. Authors lay stress on the importance of pursuing actively the research in hydrology while enlarging this research to include

the total surface of the drainage basin. They deal further with the results of new researcl on the amount of water intercepted by the top of trees, and that running down the trunk *Subject Headings:* **1. Afforestation influences on water balance 2. Precipitation interception by forests 3. Great Britain.**—*A. V.*

11.4–54 551.579:551.588.6(494.4)

Nägeli, W. (*Schweizerische Anstalt für das forstliche Versuchswesen*), **Die Wassermeszta tionen in Flyschgebiet beim Schwarzsee (Kt. Freiburg).** [The water measurement station in the Flysch region near the Schwarzsee (Freiburg Canton).] *Switzerland. Anstalt für da Forstliche Versuchswesen, Mitteilungen*, 35(1):225–241, **1959.** 8 figs., 2 tables, 4 refs. French Italian and English summaries. **DLC**—In 1951 and 1952 the Swiss Forest Research Institute established two new water measurement stations in the Flysch region of the Alpine foothills The catchments, the history, and the installations of the new stations are described. The first results as well as some prospects for future development of the research program are briefly discussed. *Subject Headings:* **1. Forest hydrology 2. Hydrometeorological stations 3. Flysch region, Freiburg Canton, Switzerland.**—*Author's abstract.*

11.4–55 551.588.6:634.92

†Weck, J., **Regenwälder, eine vergleichende Studie forstlichen Produktionspotentials.** [The "rain forest," a comparative study of the production potential of forests.] *Die Erde*, Berlin, 90(1):10–37, **1959.** 9 photos, 3 charts, 6 tables, 39 refs. English summary p. 10. **DLC, DWB**—From the point of view of forestry production geography, the forest formation termed "rain forest" includes the following classes: tropical lowland evergreen rain forest (equatorial); tropical mountain evergreen rain forest (equatorial); and temperate rain forest. These classes are characterized and defined. An attempt to classify those areas of the rain forest zones which are still stocked with primary forest, or at least fairly mature, fully grown secondary forest is made and the results given. The calculation of forest potential productivity is made on the CVP index (PATERSON). Using the reduction figures arrived at by me, we proceed from the assimilation potential to the increment potential for the best localities of each class. With the aid of yield tables, top yields which are economically feasible can in fact be determined for the best areas of the formation classes. Finally, by applying actual figures from representative undertakings these are reduced to the timber yields to be expected from average localities. On the basis of this reduction we arrive at characteristic figures for the average forest potential productivity of the formation classes. The stage of development already reached by forestry techniques would permit the realization of the potential. However, the achievement of this potential through careful forestry depends on the fulfilment of very important political, economic and social conditions. *Subject Headings:* **1. Rain forests 2. Rain forest classification 3. Forest potential productivity.**—*From author's summary.*

4. MEDICINE AND HEALTH

See also: **Sr^{90} in human bones** (Graul), 11.4 78; **Biomedical aspects of space flight** (Flickinger), **11.4–159.**

11.4–56 551.586:551.585:612.5

†Berg, Hellmut (*Cologne*), **Richtlinien für eine an der Biometeorologie des Menschen ausgerichtete Klimaklassifikation.** [Basic principles of a climatic classification oriented toward human biometeorology.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(1):1–16, **1959.** 2 tables, 40 refs. German, English and French summaries p. 1. **DWB, DLC**—Viewpoints for designing a climatic system taking into account the requirements of biometeorology of man are discussed. The classification must be based on the human heat balance. According to the different effects on the organism, the climatic boundaries must be drawn first of all on the basis of temperature and humidity. Precipitation and radiation (sunshine duration or cloudiness) should be taken into account at least as secondary characteristics of climate. A classification based on the physiology of man instead of vegetation should use frequency values to a greater extent than mean values. *Subject Headings:* **1. Human thermal balance 2. Bioclimatology 3. Climatic classification.**—*Author's summary.*

11.4–57 551.581:551.586:612(213)

†Lemaire, Robert R. (*Dakar, French West Africa*), **Influence du climat tropical sur le comportement physiologique de l'homme.** [Influence of tropical climate on the physiological conditions of man.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2 (Pt. 4), **1958.** 20 p. 18 figs., 123 refs. **DWB.** Also issued as: *Hommes et Déserts* (Bulletin of the PROHUZA Centre), Paris, No. 1 (i.e., Doc. 0158/001), **1958.** 42 p. 18 figs., 123 refs. **DWB** (M86:612 L222in)—In this extensive review of the literature on the influence of tropical climate upon the physiological reactions of man, the author discusses the following: medical observations of the effect of tropical climate upon man from the 18th century to 1943; physiological studies on the influence of climatic variables upon human beings under controlled experimental conditions during the period 1943–1957; the characteristics of hot dry and hot humid tropical climates; experimental techniques for investigating the effects of tropical climate, namely methods for investigating the action of individual variables of atmospheric temperature and vapor pressure, solar radiation, wind and the electrostatic field and methods involving the effect of the total tropical climate such as the physiological response of the same subject in a temperate and tropical climate, the physiological responses of a subject in a tropical climate compared with the normal for a temperate climate; physiological responses of an acclimatized subject compared with the normal for a tropical climate; and use of an artificial tropical climate such as the physiotron at the Laboratory of Tropical Aviation Biology at Dakar; the maintenance of homeothermy in tropical climates; experimental data on the effect of tropical climates upon metabolic heat production; the physiology of the loss of sensible and latent heat in a tropical climate; the role of sweating; hydroelectrolytic distribution under artificial tropical conditions; the response of the autonomic nervous system to tropical conditions and experimental and clinical data on the effect of tropical climates upon the thormone system. *Subject Headings:* **1. Tropical bioclimatology 2. Climatic effects on metabolism 3. Physiological climatology.**—*I.L.D.*

11.4–58 551.515.1:616–005.6/7

Rückheim, G. (*Göttingen*), **Erfahrungen über Operation, Thromboembolie und Thromboseprophylaxe unter Berücksichtigung der Wetterlage.** [Experiences with operations, thrombo-embolism and prevention of thrombosis in connection with weather conditions.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:77–80, **1958. DWB, DLC**—To determine the nature of the relationship between weather and thrombosis and embolism there must be close cooperation between clinical medicine and the weather service, a clear distinction between postoperative thrombosis and embolism and a close relation between the time of occurrence of death from thrombosis or embolism and the prevailing weather situation. Difficulties in determining the actual beginning of thrombosis, the nature of the effect of the weather stimulus upon the autonomic system, etc. are factors which make it difficult to determine the role of weather in the prediction of thromboses and embolisms. In this study the author reports the results of a year's observations on the appearance of thrombosis or embolism in a group of patients who had undergone major surgery. Out of 105 cases of postoperative fatal embolism and thrombosis, more than 90 were associated with the anterior situation of a cyclone. Weather sensitive patients treated with anticoagulants from the third postoperative day did not experience either thrombosis or embolism. *Subject Headings:* **1. Weather sensitivity 2. Cyclone effects on thrombo-embolism 3. Thrombosis 4. Embolism.**—*I.L.D.*

11.4–59 551.510.42:312.26

Prindle, Richard A. (*Air Pollution Medical Prog., Wash., D. C.*), **Some considerations in the interpretation of air pollution health effects data.** *Air Pollution Control Association, Journal*, 9(1):12–19, May **1959.** 16 figs., 2 tables, 10 refs. **DWB, DLC**—Air pollution indices and mortality data are compared to determine the geographical distribution of deaths in various urban and nonurban centers in the U. S., and also to characterize the environment so as to find associated factors or processes to which subsequent controls may be applied to prevent illness. A study of the distribution of cancer is used as a striking example of sex differences involved, particularly with regard to lung cancer. *Subject Headings:* **1. Atmospheric pollution and health 2. Mortality due to pollution.**—*R.P.*

11.4–60 551.543.1:629.113:656.0

Fischer, R.; Fryers, W. and Hunt, C. F. (*Canada*), **Do changes in barometric pressur affect the frequency rate of motor vehicle accidents?** *International Journal of Bioclimatolog and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. table, 4 ref **DWB**—"Pressure change day" was defined as an 18 hr period characterized by a fall in a mospheric pressure of at least 5 mb, followed by a 6 hr period of rising pressure. A "contr day" was defined as a period with no appreciable change in barometric pressure. The sam hours, days, weeks and months were used to match each "pressure day" with a "control day. It was found that the frequency rate of motor vehicle accidents in Regina City (Saskatchewa Canada), on 65 selected days with barometric pressure change did not differ significantly fro the accident rate on 65 days with no appreciable change. *Subject Heading:* **1. Pressure chang effects on automobile accidents.**—*I.L.D.*

11.4–61 551.55:612.014

Army develops wind chill table. *Air Conditioning, Heating and Ventilating*, N. Y 56(3):88, March **1959.** table. **DWB, DLC**—The U. S. Army Medical Research Laboratory at Fort Knox, Ky., announces the development of a wind chill table designed to gage in advanc the severity of the weather. A computed table of wind velocity versus the equivalent tem peratures on exposed human flesh is given in the report. A judicious use of such data wi prevent cold injuries to troops and others. *Subject Heading:* **1. Wind chill tables.**—*N.N.*

5. INDUSTRY

11.4–62 551.5

Russell, J. A. (*Illinois Univ.*), **The problem, method, and conclusions (of industria operations under extremes of weather).** *Meteorological Monographs* (American Meteorc logical Society), Boston, 2(9):1–9, May **1957.** 2 figs., ref. **DWB, DLC**—This introductor paper to the AMS monograph **Industrial operations under extremes of weather** ed. by J. A Russell, describes the five assumptions of the investigations upon the influence of extreme of weather on industrial location, processes and output. These assumptions are as follows 1) the extremes of weather exerting the most serious limiting effects on modern industry occu in microthermal humid continental, dry continental and high latitude climates; 2) the industria processes and levels of techniques used as bases for study are those prevailing in the U. S. Canada and Alaska in 1953; 3) the manufacture of commodities involves accumulation an processing of materials and distribution of products; 4) nonweather factors are generally o greater importance in industrial locations; and 5) modern materials, industrial techniques, etc enable the circumvention of any weather effect in industrial operation. The effects of weathe upon the industries examined in the monograph can be classed roughly into the followin categories: 1) no limitation, 2) no significant limitation, 3) significant but compensable limita tion and 4) absolute limitation. The extremes and ranges of the meteorological element temperature, humidity, rainfall, wind, etc., as they influence equipment and personnel ar summarized briefly. A map of the climates of North America classified according to th Köppen system, and a graph showing labor efficiency at various temperatures are included *Subject Headings:* **1. Industrial meteorology 2. Weather effects on industry.**—*I.L.D.*

11.4–63 551.5:625.1/2:656.2:629.122.5

Hay, W. W. (*Illinois Univ.*), **Effects of weather on railroad operation, maintenance, an construction.** *Meteorological Monographs* (American Meteorological Society), Boston, 2(9):10 36, May **1957.** 10 figs., 3 tables, 16 refs. Appendix, p. 35–36: Scott, Thomas, **Effect o weather on operation of Lake Michigan train ferries. DWB, DLC**—A comprehensive study on the ways in which temperature, ice, snowfall, wind, moisture and visibility influence the railroad industry. The effects of these elements upon roadway and track, signals and com munication equipment, upon yards and terminals, motive power and rolling stock, upo personnel (efficiency, comfort, accident incidence), train operation and accident incidence *Subject Headings:* **1. Weather effects on railroad equipment 2. Weather effects on railroad operation 3. Weather effects on train ferries 4. Lake Michigan.**—*I.L.D.*

11.4–64 551.524.372:625.734

Brock, Fred V. (*Univ. of Michigan*), **Engineering meteorology: the effects of weather and climate on concrete pavement.** *American Meteorological Society, Bulletin*, 40(10):512–518, Oct. **1959.** 7 tables, 18 refs. **DWB, DLC**—Concrete pavement may be adversely affected by weather and climate through the freezing process either within or under the pavement. The common results of freezing action that are detrimental to the durability and usefulness of the pavement are differential frost heave, loss of subsoil bearing strength, migration of subsoil, loss of strength of the concrete itself, and scaling of the pavement surface. Temperature and moisture are the dominant factors in each of these effects. *Subject Headings:* **1. Engineering meteorology 2. Freezing effects on concrete pavement.**—*Author's abstract.*

11.4–65 551.506.3:697.9(73)(02)

*Fluor Products Company, Los Angeles, Calif., **Evaluated weather data for cooling equipment design.** Los Angeles, **1958.** 83 p. 80 figs. (some fold.), 4 tables. Price: $35.00. **DLC** (TH7687.F55), **DWB** (M06.3 F646ev)—A handsome and useful manual containing tabulations and summaries of summer hourly temperature, wet bulb and wind observations for 10 yrs for 400 stations in the Continental U. S. and a few stations in Alaska, Canada, Cuba, Mexico, Japan, Europe, etc. Station directory (with coordinates), chart, a thorough discussion of the data, design values, temperature, wet bulb and wind changes with time and place, methods of interpolation, and the detailed data in tables and maps (in color) are presented with a large amount of analysis. Not only hourly frequency of values, but coincident frequencies of dry and wet bulb, of wind direction and high wet bulb temperature, and design nomograms for 45 cities (wet-dry bulb patterns), are included in data and charts. *Subject Headings:* **1. Cooling design data manuals 2. Air conditioning data manuals 3. Climatic design data for U. S. 4. United States. I. Crow, Loren W. II. Smith, Wesley W.**—*M.R.*

6. ARTIFICIAL RADIOACTIVITY

See also: **Cosmic ray radioisotopes** (Lal), 11.4–234; **Thermonuclear debris effects** (Anderson), **11.4–303.**

11.4–66 551.510.7:551.510.42

Flórián, Endre, **Természetes és mesterséges rádioaktív anyagok a légkörben.** [Natural and artificial radioactive substances in the atmosphere.] *Fizikai szemle*, Budapest, 7(5):149–155, Oct. **1957.** 9 figs., 9 refs. **DLC**—Current knowledge on natural and artificial radioactivity and its measurement is reviewed with particular attention to radioactive pollution originating in nuclear explosions and its propagation through the upper atmosphere. In Hungary routine measurements of radioactivity in rain water and atmospheric dust have been made at Debrecen (since April 1952) and Budapest (since the spring of 1955). Dangerous radiation levels have not been reached in that country. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactive fallout 3. Hungary.**—*G.T.*

11.4–67 551.510.721:551.5:662.2:539.1

Geiger, Rudolf (*Munich. Univ.*), **Meteorologische Aufgaben bei der Nutzung der Kernenergie.** [Meteorological problems raised by the use of atomic energy.] *Medizinische Klinik*, Munich, 53(28):1228–1232, July 11, **1958.** 3 figs., refs. Abstracted from reprint of 15 p. **DWB, DNLM** The large-scale atmospheric distribution of radioactive elements from nuclear tests (Nevada) is discussed and presented graphically in terms of altitude and time. Next is considered the peaceful utilization of nuclear energy in Germany which will involve careful selection of sites of the reactors, etc., based on careful local and micrometeorological studies. Directional frequency of winds at the reactor site, Garching (Munich) and the dependency of wind velocities for a 10 km distribution of gases from center of origin are shown in two graphs. Concludes that Germany needs more experienced meteorologists specifically trained in nuclear-meteorological activities. *Subject Headings:* **1. Atomic energy meteorology 2. Radioactive fallout propagation 3. Germany.**—*W.N.*

11.4–68 551.510.

Guillot, Marcel and Delaval, André, **Sur la structure de certaines poussières radioactives** [Structure of certain radioactive dust.] *Académie des Sciences, Paris, Comptes Rendu.* 249(1):85–87, July 6, **1959.** 2 refs. **DWB, DLC**—Study of the genesis of radioactive dus in the atmosphere when a radio-isotope of a rare gas leads, through transmutation, to th forming of isolated atoms of other radio-elements. Experiments made by means of α nuclea plates have shown that the aerosol resulting from this transformation is composed of soli particles in suspension within a radioactive "gas," the atoms of which remain isolated. Thes results prove that even when all radioactive dust is eliminated, there always remains a gaseou residue, of which the global radioactivity (in total ionizing power) represents 40% of th initial activity. This phenomenon could contribute to a wider dispersion of radioactive fallout the very fine dust of the aerosol being scattered in a "gaseous" radioactive medium. *Subjec Headings:* **1. Radioactivity in the atmosphere 2. Radioactive dust structure 3. Radioactiv fallout.**—*A. V.*

11.4–69 551.510.53:551.510.7

Jehanno, Célestine and Labeyrie, Jacques, **Radioactivité artificielle dans la stratosphère** [Artificial radioactivity in the stratosphere.] *Journal de Physique et le Radium,* Paris 20(7):702–705, July **1959.** 5 figs., 4 refs. French and English summaries. **DLC**—Measure ment of the concentration of radioactive beta products of artificial origin in the dust of at mospheric air was made up to 12,000 m altitude in the Paris region of Nov. 20, 1958 during th morning. A description is given of the means required for launching a cluster of 30 balloon inflated to about 7 m^3. Also the collecting device of the radioactive aerosol concentrations i described. The radioactive composition of aerosols is the same as the composition at groun level. The mean specific activity of 1 m^3 air above 5000 m is at least 90 times higher than tha at sea level. The beta activity carried by the dust was on an average 220 times higher per unit weight of air than the activity measured on the ground on the same day. *Subject Headings.* **1. Radioactivity in the stratosphere 2. Artificial radioactivity 3. Radioactive aerosols 4. Paris, France.**—*A. V. and authors' abstract.*

11.4–70 551.501.7:551.510.7

Kawano, M. (*Electrotechnical Lab. Tokyo*) and Nakatani, S. (*Tokyo Coll. Science, Tokyo*), **The absolute measurement of the concentrations of the radioactive substances in the atmosphere, in Tokyo.** *Journal of Geomagnetism and Geoelectricity,* Kyoto, 10(2):56–63, **1959.** 7 figs., 3 tables, 13 refs. **DWB**—Comparing the already known concentration of radon emanated from the radium standard solution, the absolute measurement of concentrations of radioactive substances in the atmosphere was carried out by the ionization chamber method. The concentrations of the radioactive substances in the atmosphere were $2.3 \sim 12.0 \times 10^{-16}$ C/cm^3 on fine days. The ratio of the ionization current by beta-, gamma-radiation to that by total radiation in the air of definite volume is about 5–25%, and is very much larger than that in radon being in the state of radioactive equilibrium with its decay products (the ratio is about 2–3%). *Subject Heading:* **1. Radioactivity in the atmosphere measurement techniques.** —*Authors' abstract.*

11.4–71 551.510.721

Koike, Ryoji (*Japan Met. Agency, Observ. Sec.*), **Meteorological tracing of the radioactive fallout dusts.** *Meteorological Research Notes* (*Kisho Kenkyu Note*), Tokyo, Japan, 9(2):81–88, June **1958.** 6 figs., 2 tables, 5 eqs., 11 refs. In Japanese (title romanized: Hoshanojin no kishogakuteki tsuiseki). **DWB**—Close-in fallout, intermediate fallout, delayed fallout, and global distribution of radioactive fallout dusts are discussed. Intermediate fallout is increased several times by rainfall. According to British observations, the delayed fallout of small nuclear explosions is complete after about 3 months. However, large (million ton class) explosions deliver their dust up to the stratosphere, delaying fallout rate to 10–20% annually. The vertical atmospheric radioactive distribution increases abruptly at an altitude of about 10 km. The Japanese observation reports radioactivity peak at the tropo-stratosphere boundary. The size of radioactive fallout dust ranges from less than 10μ to 400μ, depending

on the distance from the center of the explosion. If the diameters of radioactive dusts are between 5μ–400μ, the free-fall velocity can be calculated with Stoke's equation. LANGMUIR'S tabulation of cloud particle capturing rate of falling water droplets is given. *Subject Heading:* **1. Radioactive fallout.**—*J. H. Woo.*

11.4–72 551.510.721

Sheppard, P. A., **Dispersione di particelle radioattive nell' atmosfera.** [Dispersion of radioactive particles in the atmosphere.] *Rivista di Meteorologia Aeronautica*, Rome, 19(3):3–14, July/Sept. **1959.** 32 figs., eq. Italian, French, English and German summaries p. 3. **DLC**—Four types of dispersal are examined that can occur in the atmosphere and examples are given: a) on a local scale (normal working of a reactor); b) on a continental scale (a reactor meeting with a serious accident); c) on a global scale, but affecting only the troposphere (atom-bomb A); and on a global scale, affecting also the stratosphere (H-bomb). *Subject Heading:* **1. Radioactive particle dispersion.**—*Author's abstract.*

11.4–73 551.510.7:551.501

Stout, P. R.; Jones, G. B. and Delwiche, C. C., **Detection and measurement of Pb^{212} and Pb^{214} in atmospheres.** (*U. S. Atomic Energy Commission, Report*, No. TID-7512, **1956.**) p. 323–335. 4 figs., 6 tables, 9 refs. **DWB** (M94.14 S889de)—At Adelaide and Alice Springs, Australia, a study of the high and low activities of atmospheric radioactive lead (Pb^{212}, Pb^{214}) was made by filtration of air from the respiratory organs of sheep, as well as that from the atmosphere and the soil. The principal radioactive isotopes captured were Pb^{214}, Pb^{212} and the daughter products of Bi^{214}, Po^{214}, Bi^{212} and Po^{212}. Study revealed that turbulent winds are more effective in diluting radioactive gases and aerosols than steady winds. The radioactivity of soil atmospheres was very high as compared with the open atmosphere—approximately 1,000 to 10,000 times greater. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactivity measurement techniques 3. Lead isotopes 4. Australia.**—*N.N.*

11.4–74 551.510.7:551.501

Arnold, James R. (*Princeton Univ.*), **Production and distribution of radioactive isotopes in the atmosphere.** (In: California. Univ. Scripps Institution of Oceanography, **Proceedings (of the) Conference on recent research in climatology, March, 1957.** Issued Univ. of California. p. 1–5. table.) **DWB** (M8 C153co)—A table showing half-life and radiation of over a dozen radioactive nuclides produced by cosmic rays in air is presented, and their average rates of production and decay are discussed. Possible applications of these isotopes in meteorology, especially by means of the simultaneous use of several isotopes, are suggested in general terms. *Subject Headings:* **1. Radioactive isotopes 2. Radioactive tracer techniques.** —*G.T.*

11.4–75 551.510.721

Charles, B. N., **Climatological effect scaling winds for the United States.** *Sandia Corporation, Albuquerque, N. Mexico, Research Report*, SC-4152 (TR), Feb. **1958.** 53 p. figs., tables, 6 refs. **DWB** (M94.143 C475cL)—A single-wind fallout model, often referred to as the "AFSWP method," is frequently used to calculate the geographical distributions of the radiological dosages from fallout following nuclear detonations. The single wind used is termed the "effect scaling wind." In this report, mean effect scaling winds and their statistical variabilities are presented for the North American continent for seasonal periods and the weapon yields 0.1, 1.0, 10.0, and 50.0 megatons. The results are presented as isograms on maps. The basic wind data used are from a recent compilation which is believed to be vastly superior to any previously available climatological wind data. These results are suitable for use in Monte Carlo methods for computing the probabilities of occurrence of various radiological dosages. They may also be used for simple hand-computed estimates of target environs that are subject to various probabilities of experiencing specified radiological dosages after nuclear attacks. *Subject Headings:* **1. Effect scaling winds 2. Radioactive fallout calculations.**—*Author's abstract.*

11.4–76 551.501:551.510.

Weise, L., **Die Messung kleinster Aktivitäten in Wasser und Luft.** [Measurement of low level radioactivity in water and air.] *Zeitschrift für Instrumentenkunde*, Brunswick, 67(10): 251–257, Oct. **1959.** 6 figs., 2 refs., 14 eqs. German, English, French and Spanish summaries p. 251. **DWB**—Some of the most convenient methods of measuring low level radioactivity in water and air are discussed. From fundamental statistics, a criterion for the efficiency of different methods, based on LOEVINGER and BERMAN, is developed. In comparing two counters, the one with higher sensitivity E and larger E^2/R_n is always better. Here R_n designs the background rate. If the counter with higher sensitivity has a lower ratio E^2/R_n, the relative efficiency depends upon the sample strength. A comparison of different detectors using the preceding criterion, shows that the scintillation counter with Thallium-activated NaI-crystal is the best for the detection of low gamma activities. For measuring very low alpha and beta activities, windowless counters such as the proportional counting tube, in which the samples are dispersed into the counting space are preferable. Some industrially manufactured arrangements which are based upon the above-mentioned principles are described and illustrated by photos and diagrams. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactivity measurement techniques.**—*Author's abstract.*

11.4–77 551.510.721:581.19:636.31

Gorham, Eville (*Freshwater Biological Assoc.*), **Accumulation of radioactive fall-out by plants in the English Lake District.** *Nature*, London, 181(4622):1523, May 31, **1958.** 2 figs. **DWB**—The accumulation of radioactive fallout by plants in the English Lake District is presumed to be due to fallout from nuclear explosions. Investigation also concludes that the high concentration of strontium-90 in the bones of upland sheep in that area may be due in part to their reliance on such infected plants for fodder, particularly in hard times. Thirty-five species of angiosperms and mosses were studied. *Subject Headings:* **1. Radioactive plants 2. Strontium 90 in sheep bones 3. Lake District, Eng.**—*N.N.*

11.4–78 551.510.721:611.71

Graul, E. H., **Gefahren durch Aufnahme radioaktiver Isotope in den Körper: Das "fall-out" problem.** [Dangers from the uptake of radioactive isotopes by the body: the fallout problem.] *Die Umschau*, Frankfurt a.M., No. 1:12–15, **1958.** fig., 2 tables, 1 ref. **DWB, DLC**—The various radio isotopes occurring as by-products of nuclear explosions, and their biological properties are tabulated and discussed. In particular, the author examines various reports to be found in international (especially American) literature concerning the world distribution of Sr^{90} fallout and existing and expected radiation levels. At present the average Sr^{90} content of human bones is 1/10,000 of the maximum permissible concentration. In ten years this will increase by a factor of 10 (to 1/1,000 MPC). On the basis of statistical deviation part of the population will absorb 10 times more (or 1/100 MPC). Since there are indications that the currently accepted MPC is too high by a factor of 10, and considering that infants absorb more damaging substance than the average, by a factor of 5 to 10, it is concluded that Sr^{90} fallout values have already reached the order of magnitude of maximum permissible concentration. *Subject Headings:* **1. Strontium^{90} fallout 2. Strontium^{90} in human bones 3. Maximum permissible SR^{90} accumulation.**—*G.T.*

11.4–79 551.510.721

Kuroda, P. K. (*Radiological Physics Div. Argonne Natl. Lab.*), **On the stratospheric Sr^{90} fallout.** *U. S. Atomic Energy Commission, ANL*, No. 5920, Oct. **1958.** 40 p. 16 figs., 14 refs. At head of t-p.: Argonne National Laboratory. **DWB** (M10.721 U581on)—The fraction (α_D) of the delayed fallout in the total fallout (F) of a fission product A is given by

$$\alpha_D \cong [yB/yA - T \cdot \exp\{(\lambda_B - \lambda_A)t\}] \cdot (yB/yA - Sb)^{-1},$$

where yB/yA is the ratio of a pair of chemically similar fission products B and A freshly produced by a nuclear explosion at $t = O$, λ_A, and λ_B are the decay constants of A and B, Sb is the B/A ratio in rain water or in the troposphere at time t. The fraction (αS) of the stratospheric fallout in the total fallout (F) is usually very nearly the same as the fraction (D) of the delayed fallout. The ratios of Ba^{140}/Sr^{90}, Sr^{89}/Sr^{90} and Ba^{140}/Sr^{89} in a series of rainfalls which occurred

Lemond, Ill., during the period between Oct. 15, 1957 and June 1, 1958, have been measured, and the rates of stratospheric and tropospheric fallout have been calculated. The average rate of stratospheric fallout 2.4 mc/km²/year and that of tropospheric Sr^{90} fallout 0.16 mc/km²/year, i.e., 94% of the total Sr^{90} fallout was stratospheric. The rate of Sr^{90} fallout decreased in the fall and increased in the spring. Fundamental principles of the method described in this report are directly applicable to the problem of the detection of nuclear test explosion. *Subject Heading:* **1. Strontium^{90} fallout.**—*Author's abstract.*

11.4–80 551.510.721

[Loper, Herbert B. and Libby, W. F.], **Fallout of strontium-90.** *Science*, Wash., D. C., 129(3353):884-885, April 3, 1959. **DLC** -The report contains the text of the letter submitted on Feb. 19, 1959 by Maj. Gen. Herbert B. Loper (ret.), special atomic energy assistant to the Secretary of Defense, to Willard F. Libby, Commissioner, Atomic Energy Commission. The letter discussed the fallout of Sr^{90} from nuclear tests in the U. S. as released on March 23, 1959, in censored form, by Sen. Clinton P. Anderson (D. N.M.), chairman of the joint Congressional Committee on Atomic Energy. *Subject Heading:* **1. Strontium^{90} fallout.**—*N.N.*

11.4–81 551.510.7:539.16:546.26:546.11.02

Craig, Harmon (*Scripps Inst. of Oceanog.*), **Radiocarbon and tritium distribution and mixing rates.** (In: California. Univ. Scripps Institution of Oceanography, **Proceedings (of the) Conference on Recent Research in Climatology, March, 1957.** Issued Univ. of California. p. 53-73. 2 figs., 6 tables. Also: Benioff, Paul A. (Rad. Lab. Univ. of Calif., Berkeley), **Calculation of the tritium production rate from cosmic ray data and experimental cross sections.** *Ibid.*, p. 74–76. 3 refs. **DWB** (M8 C153co)—Exchange processes of radiocarbon and tritium in the atmosphere, earth and ocean are analyzed. The natural abundance of tritium is found to be ten times as large as the amount produced by cosmic rays. A hypothesis of solar production of tritium is advanced to account for this discrepancy. Benioff, using more recent data than Craig, finds the cosmic ray tritium production to account for half the natural production, which still makes the solar hypothesis appear attractive. *Subject Headings:* **1. Radiocarbon distribution 2. Tritium distribution.**—*G.T.*

11.4–82 551.510.721

Adamczewski, I. and Dera, J., **Badania skazeń radioaktywnych powietrza i wód opadowych w rejonie wybrzéża gdańskiego.** [Investigations on air and water contamination by radioactive fallout in the Danzig littoral region.] *Acta Geophysica Polonica*, Warsaw, 6(4):331–361, **1958.** 30 figs., table, 13 refs., 18 eqs. Russian and English summaries p. 359–361. **DWB, DLC**—The first part of the paper contains a survey of the most frequently used methods for measuring air and water contamination by radioactive fallout. Diagrams and illustrations of the instruments used by various authors are given, also instrument characteristics. In the second part, the authors present some results of observations made in the Gdansk littoral region in 1957 and up to April 1958. The method used by the authors in measuring air contamination was a discontinuous one. Every day during a 2 hr period the air was sucked through dry filter wadding by means of a 2 hp centrifugal type ventilator. The wad with the aerosol precipitate was burned and the activity of the ash determined with a GM counter. Ash activity was measured at the following rate: first measurement 20 min after receipt of precipitate, second—after 24 hrs, third—after 48 hrs, fourth—after 10 days, further measurements at lengthy intervals. In this way some approximate data on the isotopic composition of the contaminated material under examination could be obtained. The results shown indicate several major and a number of minor clouds carrying radioactive dust and transported by air currents from the places where the explosions occurred passed over the observation points. Observing the radioactive contamination of atmospheric precipitation, the authors determined that these may reach the order of 10^{-6} to $10^{-5}\mu$ C/ml precipitation. In such cases the contamination exceeds the radioactivity admissible in natural water by one or even two orders. In order to determine the mean energy of β-rays originating from the radioactive dust collected in the air, absorption curves of β-rays in aluminum were made from numerous samples. Numerous radiochemical analyses of the samples proved the presence in them of radioactive isotopes of the following elements: cerium and ittrium (jointly), praseodymium and neo-

dymium (jointly) and also caesium and zirkonium. The quantity of strontium exceeded slightly the limit of measuring error. A major difficulty in analysis was caused by the high SiO_2 content of the samples which absorbed part of the isotopes, preventing their solutio One can not exclude the possibility that a great part of the strontium, the presence of whic may be expected in the sample, remained in its undissolved state. Research along these lin and systematic measurements of air contamination are being continued. *Subject Heading* **1. Radioactive fallout 2. Radioactivity in precipitation 3. Danzig.**—*Authors' abstract.*

11.4–83 551.510.721:628.1

Hawkins, M. B., **Summary of problems relating to local fallout contamination of wate supplies.** California. Univ. at Berkeley. Institute of Engineering Research, Contrac CD-SR-58-40, (Unnumbered Report), Feb. 24, **1959.** 70 p. figs., tables, 67 refs. At head c t-p.: Progress Report. **DWB** (M10.721 C153pro)—The progress achieved in the study of th contamination of water supplies by local fallout from nuclear warfare is summarized. Th report discusses the existing techniques for determining emergency maximum permissibl concentrations of radioisotopes in water and the use of concentration internal dose relationship for evaluation purposes. The fallout contamination levels for nuclear attacks of variou intensities are estimated for purposes of establishing limits to the problem. The existing un classified knowledge on the significant properties of local fallout is discussed. The component of the hydrology cycle and water supply systems are discussed in relation to the fate of fallout The tentative conclusions are: (1) Surface water supplies may become excessively contami nated, (2) Most ground water sources should have no immediate problems, (3) There need to be considerable clarification in the matter of the development of maximum permissibl concentrations for operational use, (4) In evaluations of vulnerability, each water supply system must be considered separately, and (5) The research proposals for continued work o this Project indicate a logical approach. *Subject Headings:* **1. Radioactive fallout hazards 2. Radioactive water supply 3. Water pollution.**—*Author's abstract.*

11.4–84 551.510.721:551.501.81:551.509.58

Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research, **Application of weather radar to fallout prediction.** Contract DA-36-039-SC-75030, Quarterly Technical Report, No. 2, June 1–Aug. 31, 1958, issued Sept. 15, **1958.** 9 p. 2 figs. DWB (M01.81 M414rqe)—Excellent data have been obtained during the past quarter for the investigation of the structure of squall lines and bands of convective showers associated with cold fronts. Analysis of the signal intensity contours for several of these storms has been started. Five frequency spectra of gustiness have been computed from the time variations of R-meter readings. They show a sharp increase in the energy for gust frequencies below 0.02 cycle per second. A large number of consecutive samples of rain water have been collected in three storms and tested for radioactivity. Significant variations in the beta activity occur over periods of only a few minutes. We consider these data to be of value in investigating the process and prediction of radioactive rainout and are trying to make arrangements for continuing to take them. Papers on several aspects of the research are being prepared for presentation at the Seventh Weather Radar Conference in November. *Subject Headings:* **1. Weather radar application to fallout forecasting 2. Radioactive fallout pattern forecasting.** —*Author's abstract.*

C. ASTRONOMY AND ASTROPHYSICS

1. ASTROPHYSICS

See also: **Handbook of physics-astrophysics, 11.4–1.**

11.4–85 536.24:533.5 551.510.41:546.11

Chapman, Sydney (*Geophysical Institute, College Alaska, High Altitude Observatory, Boulder, Colorado*), **Cosmic examples of heat conduction in very rare rotating or expanding gases.** *Annales de Géophysique*, Paris, 15(4):434–444, Oct./Dec. **1959.** 9 refs. French and

English summaries. **DLC**—As MAXWELL first showed, in a very rare gas tangential stresses are produced by nonuniformity of temperature as well as of motion. Similarly the heat flow in a very rare moving gas is not fully given by the usual formula. The additional terms in the heat flow are derived for two types of motion, namely rotation and radial expansion. Numerical illustrations are given relative to fully ionized interplanetary atomic hydrogen, and to neutral atomic hydrogen in the earth's atmosphere and in interstellar space. It is shown that in such extremely rare gases the additional terms, in some cases of interest to cosmic physics, may have some importance relative to the usual term; but they are unlikely to affect the radial distribution of temperature. *Subject Headings:* **1. Heat conductivity in rarefied gases 2. Atomic hydrogen in earth's atmosphere 3. Ionized interplanetary atomic hydrogen.**—*Author's abstract.* Ⓢ

2. SOLAR PHYSICS

See also: **Handbook of physics,** 11.4–1; **Solar physics texts** (Abetti), 11.4–6; **Rocket photographs of sun** (Bruzek), 11.4–145; **Solar flare obs. from rockets,** 11.4–149; **Solar effects on circulation** (van den Dungen), 11.4–236; **Solar spectrum** (Dunkelman, Scolnik), 11.4–243.

11.4–86 551.590.21:523.746

d'Azambuja, Marguerite (*Obs. at Meudon*), **Les taches du soleil et leur périodicité.** [Sunspots and their periodicity.] *L'Astronomie*, Paris, 73(3):113–118, March **1959.** 3 figs. **DLC**—Description of spots, faculae, centers of activity and enumeration of the circumstances accompanying the formation of a center of solar activity. Author gives a short historical account of the investigations which have led to the discovery of the undecennial cycle of spots. The 11-year value is an average established on observations covering a lapse of two centuries; the intervals between two minima can vary between 9 and 13 yrs. *Subject Headings:* **1. Solar activity 2. Sunspot cycles.**—*A. V.* Ⓢ

11.4–87 523.74 551.590.21:551.594.5:551.515

Djakow, Anatole, **L'activité solaire, les aurores boréales exceptionnelles et les instabilités troposphériques.** [Solar activity, unusual northern lights and tropospheric instabilities.] *L'Astronomie*, Paris, 73(4):183–185, April **1959.** table. **DLC**—Summary of a paper by the author, dedicated to the French Astronomic Society in memory of its founder, CAMILLE FLAMMARION. A table summarizes the ionospheric and tropospheric solar peculiarities of the main tropospheric disturbances in connection with solar phenomena during 1957–58. Conclusions of are fairly clear: a) influence of solar activity on the displacements of air masses (tropospheric circulation) appears distinctly; b) consequence of this influence is the appearance of tropospheric systems with very great instability. From these conclusions, it is inferred that it is possible to forecast large scale weather processes. *Subject Headings:* **1. Solar activity 2. Tropospheric disturbances 3. Solar activity—tropospheric circulation relationships.**—*A. V.* Ⓢ

11.4–88 523.75

Jefferies, John T.; Smith, Elske v.P. and Smith, Henry J. (*all, High Altitude Observatory, Colo. Univ.* and *Harvard Observatory Solar Project, Sacremento Peak Observatory*), **The flare of September 18, 1957.** *Astrophysical Journal*, Chicago, 129(1):146–163, Jan. **1959.** 16 figs., 6 tables, 19 refs., 5 eqs. **DWB, DLC**—A set of spectra of the disk flare of Sept. 18, 1957, is discussed. The spectra, covering simultaneously a wave length range of λλ3900–7200 at a dispersion of ~2A/mm, cover the period through the maximum phase. The Balmer lines reached a central intensity in excess of three times the neighboring continuum and were at that time exceedingly wide. Several helium lines were in emission including λ4686 of He II, as well as the prominent neutral lines. The data indicate that the excitation conditions in the visible flare vary rapidly with depth and suggest that the visible flare is merely an extension of a more powerful excitation. The Balmer series wing shapes are shown to be compatible either with Stark effect or with a particular form of velocity field of macroscopic or microscopic motions. *Subject Headings:* **1. Solar flare, Sept. 18, 1957 2. Balmer lines.**—*Authors' abstract.* Ⓢ

11.4–89 523.74/77:546.26

Laborde, Georges, **Essai de détermination de la pression dans les taches solaires.** [Attempt to determine pressure in sunspots.] *Académie des Sciences, Paris, Comptes Rendus,* 248(13):1941–1943, April 1, **1959.** fig., 5 refs. **DWB, DLC**—Study of the close dependence of pressure in the spot on the law of temperature adopted for photosphere. For this purpose, the author investigates the darkening of the lines of the C_2 and MgH molecules and examines the possible influence of triatomic molecules, particularly those forming from C_2, taking into account relations such as $C_2+H \leftrightarrows C_2H$ and $C_2+C \leftrightarrows C_3$. Spectroscopic study of spots and photosphere has led, through consideration of the equivalent widths of the lines of C_2-molecule, to an estimation of pressure in the spot. At the mean optical depth where C_2 lines appear, pressures in spot and photosphere are in the same range. *Subject Headings:* **1. Pressure in sunspots 2. Photosphere 3. Sunspots 4. Spectral lines of C_2-molecule.**—*A. V.* Ⓢ

11.4–90 551.590.21:523.755

Martres, M. J. and Olivieri, G. (*Obs. at Meudon*), **Eruption chromosphérique avec déplacement de matière absorbante du 6 février 1959.** [Chromospheric eruption with displacement of absorbent matter on Feb. 6, 1959.] *L'Astronomie,* Paris, 73(4):166–167, April **1959.** plate, ref. **DLC**—Description of the chromospheric eruption observed on Feb. 6, 1959, with the Lyot monochromatic heliographs set up at Paris-Meudon and Saint Michael (Haute-Provence). A plate reproducing 9 photos gives the evolution of this eruption with absorbent matter displacement. *Subject Headings:* **1. Chromosphere eruptions 2. Lyot monochromatic heliographs 3. Haute-Provence, France.**—*A. V.* Ⓢ

11.4–91 523.74

Müller, Rolf, **Die Sonnenfleckentätigkeit im ersten Halbjahr 1958.** [Activity of sunspots during the first half of 1958.] *Die Sterne,* Leipzig, 35(1/2):29–31, **1959** and 35(3/4):78–81, **1959.** 3 figs. **DLC**—The daily activity of sunspots is variable; 6 months are required to know the course of the maximum of sunspots. A figure shows a decrease in the activity of sunspots from one month to another. Also the eruption activity decreased in connection with the 6 preceding months. A table gives the provisional statistics of the number of eruptions, classified according to the intensity for the first and second half of 1957 and the first half of 1958. *Subject Heading:* **1. Sunspot activity.**—*A. V.* Ⓢ

11.4–92 523.74:550.385.4:551.594.5:539.19

Singer, S. Fred (*Physics Dept. Univ. of Maryland*), **Geophysical effects of solar corpuscular radiation.** *Annales de Géophysique,* Paris, 14(4):433–437, Oct./Dec. **1958.** 15 refs. **DLC**—Magnetic storms, auroras and cosmic ray variations are explained from a unified theoretical point of view. The sudden commencement of magnetic storms seems to be due to ionospheric currents initiated by solar corpuscular radiation. The main phase of storms is explained in terms of an extra terrestrial ring current set up by the drifting motion of trapped solar particles. These trapped particles are also accelerated to high enough energies to cause aurora; the acceleration proceeds mainly by Fermi collisions with magnetohydrodynamic waves (which give rise to geomagnetic micropulsations). Decreases in cosmic ray intensity which accompany magnetic storms are produced by a diffusive deceleration process in interplanetary space. *Subject Headings:* **1. Corpuscular radiation 2. Magnetic storms 3. Auroras 4. Cosmic ray variations.**—*A. V.*

11.4–93 523.74/77

Stemmler, Gerhard, **Sonnenfleckengruppen in grossem Äquatorabstand.** [Sunspot groups at great distance from the equator.] *Die Sterne,* Leipzig, 34(9/10):186–188, **1958.** table. **DLC**—At latitudes of +40° and near the solar equator, no sunspots are normally observed. It is interesting to consider how many sunspot groups have been registered in heliographical latitudes of $\gtrless 40°$. Research was carried out on the "heliographic charts of the photosphere" during 1951–1956 and on the "map of the sun" from Jan. 1 to Sept. 9, 1957. A complete table on this subject is given. *Subject Headings:* **1. Sunspots 2. Heliographic charts of the photosphere.**—*A. V.*

11.4–94 523.74

Waldmeier, Max (*Observatoire Fédéral, Zurich*), **Taches solaires de janvier 1959.** [Sunspots in January 1959.] *L'Astronomie*, Paris, 73(2):68–72, Feb. **1959.** 4 photos, table. **DLC**—This article reports the result obtained by an amateur in possession of simple equipment. Short description of the instrument. Photos show evolution and transformation of groups of spots photographed on Jan. 25 and 26, 1959. A table gives the relative Wolf numbers (daily values) for the year 1958. *Subject Heading:* **1. Sunspots.**—*A. V.* Ⓢ

11.4–95 523.746

Xanthakis, Jean, **Les aires des taches solaires vers le nord et vers le sud de l'équateur du soleil en fonction du temps d'ascension.** [Sunspot areas northward and southward of the Sun's equator, with regard to the ascension-time.] *Académie des Sciences, Paris, Comptes Rendus*, 249(15):1315–1317, Oct. 12, **1959.** fig., table, 2 refs. **DWB, DLC**—The annual values of solar activity (areas of spots and relative numbers) can be expressed with respect to the ascension-time $T = T_{max} - T_{min}$, when the parts (min − max) and (max − min) of the corresponding curves are considered separately. When the same relations are applied but considering the spot areas northward and southward of the equator separately, it is stated that the annual maximum at each cycle cannot be represented by a mere parabola. This results from the fact that the curves of the spot areas northward and those southward of the Sun's equator differ as well in shape as in maximum height for the same cycle of solar activity. *Subject Headings:* **1. Sunspot activity 2. Sunspot cycles.**—*A. V.* Ⓢ

11.4–96 523.75

Zirin, Harold (*High Alt. Observ., Univ. Colo.*), **Physical conditions in limb flares and active prominences, Pt. 2, A remarkable limb flare, December 18, 1956.** *Astrophysical Journal*, Chicago, 129(2):414–423, March **1959.** 4 figs., 5 tables, 11 refs., eq. **DWB, DLC**—Spectra of a bright limb flare show many lines of metals, hydrogen, and helium. The temperature in the flare, as deduced from line broadening, is in the range 50,000°–100,000°. Relative line intensities also indicate high temperatures. The coronal lines λ4086 (CA XIII) and λ5694 (Ca XV) are strongly enhanced during the flare. From the behavior of both lines it is concluded that λ5694 is surely due to Ca XV. Continuous emission from a dense coronal cloud was observed just before the flare. This cloud condenses sharply during the flare and dissipates afterward. The continuous emission from the flare appears due to electron scattering. *Subject Headings:* **1. Solar flare, Dec. 18, 1956 2. Limb flares.**—*Author's abstract.* Ⓢ

3. PLANETS

11.4–97 523.22

†Berlage, H. P. (*Koninklijk Nederlands Meteorologisch Instituut*), **The basic scheme of any planetary or satellite system corrected and re-analyzed.** *Akademie van Wetenschappen te Amsterdam. Afdeeling voor de Wis- en Natuurkundige Wetenschappen, Proceedings of the Section of Sciences, Ser. B*, 62(1):63–83, **1959.** 2 figs., 2 tables, 27 refs., 59 eqs. **DLC**—The author gives a corrected version of the basic scheme of any planetary or satellite system, published in these **Proceedings, 1957.** He attempts to prove that all known actual systems conform to this unified picture, thus supporting his theory of the origin of planets and satellites from discs of nebulous matter rotating round their primaries, by the mere mechanical transformation of these discs, through loss of energy due to viscosity, into sets of concentric rings. The arrangement of the actual systems in the basic scheme and the relation between their Bode ratio and the dimensions and mean densities of their primaries are surprisingly exact. These rules suggest that a solar gaseous envelope still existed at the time when its dust content gathered into the rings which gave birth to the planets, whereas the planetary discs generating satellite rings consisted from the beginning of solid particles. The author is led to the conclusion that Saturn and its system probably is the oldest condensation product of the solar nebula and that Pluto probably is a normal planet beyond Neptune in the terrestrial class, its mean density amounting to 2.9. In the second part of the article, the author gives a direct proof of the tendency shown by secondaries to revolve around their primaries at distances which obey a geometric progression. It is concluded that every satellite system follows the basic

scheme from righ to left and conforms to one or more of the possible systems, and is characterized by increasing Bode ratio. He successively treats of the system Earth and Moon, Mar and its satellites, Jupiter and its satellites, Saturn, Uranus, Neptune and their respectiv satellites, and of Planetoids and Plutoids. *Subject Headings:* **1. Planetary or satellite system 2. Origin of planets and satellites 3. Solar nebula.**—*From author's abstract.* Ⓢ

11.4–98 551.521.14:523.4

Boggess, Albert, III and Dunkelman, Lawrence (*both, U. S. Naval Res. Lab.*), **Ultraviole reflectivities of Mars and Jupiter.** *Astrophysical Journal*, Chic., 129(1):236–237, Jan. **1959** table, 5 refs. **DWB, DLC**—Ultraviolet observations of Mars and Jupiter were made on th night of March 28, 1957 from New Mexico in order to measure the stellar fluxes at wave length near 2700 A. The report gives a brief analysis of the results. The flux at 2700 A for Mars a a phase angle of 32.4° was 2.0×10^{-8} ergs/cm² sec. Its reflectivity was 0.24. Jupiter showe a reflectivity of 0.26 at a phase angle of 2.3° and a flux density of 1.5×10^{-7} ergs/cm² sec. The total predicted reflectivity was only 0.15. It was found that in order to make the predicte reflectivity consistent with observation, the haze particles must have a considerably highe reflectivity in ultraviolet than in blue light. *Subject Heading:* **1. Albedo of planets.**—*N. N.* Ⓢ

11.4–99 521.154:523.4

Hess, Seymour L. (*Dept. of Meteorology, Florida State Univ.*), **Atmospheres of other planets.** *Science*, Wash., D. C., 128(3328):809–814, Oct. 10, **1958.** 3 figs., table, 19 refs. **DLC**—This is a report on the telescopic study of Venus, Mars and Jupiter. The radiometric temperature of Venus is near −38°C for both its dark and sunlit parts. The surface temperature of Mars may rise up to +30°C when the sun is directly overhead; this decreases rapidly towards the pole during the winter. Jupiter's planetary temperature indicates about −145°C and its cloud temperature at −120°C. The actual temperature of Jupiter may be a little higher. Details of their cloud motions are discussed. *Subject Heading:* **1. Planetary atmospheres.** —*N. N.*

11.4–100 523.34

Whipple, Fred L. (*Dir., Smithsonian Astrophys. Obs.-Prof. of Astronomy, Harvard College Observatory*), **On the lunar dust layer.** *U. S. Air Force. Office of Scientific Research, Vistas in Astronautics: second annual Symposium, April 1958.* pub. N. Y. Pergamon Press, **1959.** p. 267–272. 18 refs. **DWB** (629.1388 U581as)—Observations of the Moon made optically in the infrared by radio and by radar indicate that the Moon's surface consists of a thin insulating layer overlying denser materials, producing a surface that is a very poor reflector at all frequencies so far observed. At dimensions comparable to the wave length of light, the surface is almost completely rough, but it is relatively smooth at wave lengths and dimensions comparable to 10 cm. The Moon's surface is subject to bombardment by meteoritic material and corpuscular radiation (protons) and to a slow rain of dust, molecules, atoms, and ions, as a consequence of the meteoritic bombardment and sputtering. The writer concludes that these processes coupled with solar radiation will tend to cement the dust into a weak, porous matrix and that no appreciable quantity of loose dust will be found on the Moon's surface. The surface material should not blow badly in a rocket jet and should be sufficiently rigid for support of the normal structures and operations required of a lunar expedition. *Subject Headings:* **1. Lunar dust layer 2. Moon's surface.**—*Author's abstract.* Ⓢ

4. ECLIPSES

11.4–101 523.78

Meeus, J., **De zonsverduistering van 2 oktober 1959.** [The solar eclipse of Oct. 2, 1959.] *Hemel en Dampkring*, The Hague, 57(4):89–92, April **1959.** 2 figs., 3 tables. **DWB, DLC**—The article contains data on beginning, end (in U.T.) and magnitude of the solar eclipse of Oct. 2, 1959 for several places, in particular for the Canary Islands, the Netherlands and Belgium. The data are drawn from the U. S. **Ephemeris and Nautical Almanac.** *Subject Heading:* **1. Solar eclipse, Oct. 2, 1959.**—*A. V.* Ⓢ

11.4–102 523.78

Waldmeier, M., **Die totale Sonnenfinsternis vom 12. Oktober 1958.** [The total sun eclipse of Oct. 12, 1958.] *Die Sterne*, Leipzig, 35(9/10):176–182, **1959.** 4 figs. **DLC**—The totality line occurred in the South Pacific area but temporary high altitude stations established in Chile made successful coronal observations (the sun being near the horizon): structure of the corona (number, position and orientation of coronal rays), photometry of the inner and outer corona, polarization measurements and cinematography. Interesting photographic observations were made from an aircraft (3500 m). *Subject Heading:* **1. Solar eclipse, Oct. 12, 1958.** *A. V.* Ⓢ

5. METEORS

11.4–103 521.7:551.510.3:551.524.7

Kovalevsky, Jean (*Obs. of Paris*), **Le météore du 17 novembre 1955.** [The meteor on Nov. 17, 1955.] *L'Astronomie*, Paris, 73(5):195–203, May **1959.** 7 figs. **DLC**—Description of the meteor of Nov. 17, 1955, which was observed under five successive aspects. Analysis of nearly 6000 observations made it possible to describe the 5 phases of the phenomenon. Author investigates the trajectory of the bolide in the atmosphere and determines the following elements: vertical plane of the trajectory, ground-plane of the vanishing point, altitude of this position, tangent to the trajectory at this point, approximate shape of the trajectory in its plane and speed of the fire ball (nearly 30 km/s). Author determines also the elements of the orbit of the bolide. A diagram shows the relationships between the various aspects presented by the bolide and the temperature and density conditions of the atmospheric layers crossed. *Subject Headings:* **1. Meteor, Nov. 17, 1955 2. Meteor trajectories 3. Temperature and density of upper atmosphere 4. Meteor atmospheric density determination 5. Bolides.** *A. V.* Ⓢ

11.4–104 551.590.25:533.15

Murray, E. L. (*Physics, Dept., Univ. of Adelaide*), **Ambipolar diffusion of a meteor trail and its relation with height.** *Planetary and Space Science*, N. Y., 1(2):125–129, April **1959.** 3 figs., table, 10 refs., 3 eqs. **DWB**—Investigation of the relation between the ambipolar diffusion coefficient, D, of a meteor trail and height shows that considerable random fluctuations occur. It is however possible to obtain a statistical relation between these parameters. Regression lines have been derived for the relation between log D and height and it is shown that care must be exercised in the correct choice of the two possible regression lines. *Subject Heading:* **1. Meteor trail diffusion.**—*Author's abstract.* Ⓢ

D. OUTER ATMOSPHERE

1. GEOMAGNETISM

See also: **Magnetic storms** (Singer), 11.4–92; **Solar eruption effects on magnetic storms** (Polet), **11.4–122**; **Geomag. effects on cosmic rays** (Demers), **11.4–133.**

11.4–105 551.510.535:550.385.4

Liakhova, L. N., **Ionosferno-magnitnye buri.** [Ionosphere magnetic storms.] *Priroda*, Moscow, No. 6:89–91, June **1958.** 2 figs. **DLC**—In connection with intense solar activity of September 1957, the Scientific Institute of Terrestrial Magnetism investigated the relationship between solar activity and geophysical phenomena. During this period 5 very large ionospheric-magnetic disturbances were observed, of which the most intense were two storms at the beginning and end of the month. The active area of the sun during the second rotation (end of August, beginning of September) consisted of three groups of spots, one of which had an area of 2950 million parts of the solar hemisphere and where passage through the solar meridian was accompanied by intense solar activity. During this rotation bright floccular fields and chromospheric plates were observed. One of the most intense of these was accompanied by increased radio radiation and the 500 mHz frequencies. Thirty-eight hours after this flare a very intense magnetic storm began with active periods. A new intense flare was

accompanied by radio radiation in the frequencies of 500 and 1500 mHz. After the beginnin of the magnetic disturbance (12 hrs and 54 min), the critical frequency of the F2(*fo*F2) laye began to decrease and in the most active periods of the magnetic storm reflections from th F2 layer were entirely absent. A layer decrease in the critical frequencies of the F2(*fo*F layer attaining as much as 70% of the relative mean normal value was observed in mea latitudes; the maximum intensity of the ionospheric storms was attained at night from Sept. to Sept. 25. Short wave signals were absorbed completely in the north except for individu hours. *Subject Headings:* **1. Magnetic storms 2. Ionospheric disturbances 3. Solar fla effects on ionosphere.**—*I.L.D.*

11.4–106 550.385:662.2:539

Selzer, Edouard, **Enregistrements simultanés en France, à l'Equateur et dans l'An tarctique, des effets magnétiques engendrés par l'"Expérience Argus."** [Simultaneous recor ings in France, at the equator and in the Antarctic, of the magnetic effects resulting from th "Argus Experiment."] *Académie des Sciences, Paris, Comptes Rendus*, 249(13):1133–113 Sept. 28, **1959.** 3 refs. **DWB, DLC**—The "Argus Experiment," a series of three nuclea explosions at about 480 km altitude above the South Atlantic Ocean, gave rise in each of th three cases, to magnetic signals which were recorded with great sharpness and at precise m ments at the French stations at Chambon-la-Forêt, at Bangui and at those in the Antarcti The analysis of the recordings prove: a) the signals spread over large parts of the terrestri globe with a speed of about 1000 km/s at the surface without following the lines of force of th magnetic field; b) the easy penetration of the signals within the Antarctic auroral zone; c) th absence of a well defined oscillation period. The oscillations are in general fairly irregul and seem to line up roughly in two categories, around 1 and 2 sec. From this it appears tha the interaction phenomena between the two types of toroidal and poloidal oscillations indicate by the terrestrial hydromagnetic waves must be much more important than the prese fundamental theories led us to believe. *Subject Headings:* **1. Atomic explosion effects 2. Mag netic disturbance 3. Magneto-hydrodynamic waves 4. "Argus Experiment."**—*A. V.* Ⓢ

2. AURORAS

See also: **Unusual auroras** (Djakow), **11.4–87**; **Auroras** (Singer), **11.4–92.**

11.4–107 551.594.5:551.501:551.506.2

Barbier, D. (*Institut d'Astrophysique de Paris*), **Participation française à l'observation de aurores de latitudes faibles.** [French participation in the observation of auroras at lo latitudes.] *La Météorologie*, Paris, Ser. 4, No. 53:2–10, Jan./March **1959.** fig., 2 table French, English and Spanish summaries. **DWB**—Meteorological stations, weather ship selected merchant ships and voluntary observers have collaborated for visual auroral observa tion during the IGY in France. The 19 auroras which were visually observed in—and in th proximity of—France, are listed. At the observatory of Haute-Provence, auroral activit was photoelectrically observed and recorded during 46 nights. These observations revealed new phenomenon called "monochromatic arc 6 300." This phenomenon appears on recordin made at 15° on the horizon. It is characterized by two maxima, obviously at the same distanc from the north. The maxima, which are 100° to 110° distant from each other fall into line on a arc. The duration of the phenomenon may reach 7 hrs. The auroral observation method use at the Geophysical Observatory of Tamanrasset is described and comments are made on th aurora observed on July 8, 1958. *Subject Headings:* **1. Auroral observation program 2. IG auroral program 3. French participation in IGY 4. Monochromatic arc 6300 5. Franc** —*A. V.* Ⓢ

11.4–108 551.594

Flammarion, G. C., **Aurores boréales.** [Aurora borealis.] *L'Astronomie*, Paris, 72(9 367–370, Sept. **1958.** 2 photos. **DLC**—Report on the observations of auroras made France during 1957 and particularly during the third decade of September. *Subject Headin* **1. Auroras, France.**—*A. V.*

11.4–109 551.594.5:778.3

Gartlein, C. W., **Auroral photography.** *International Geophysical Year*, 1957/1958 *Annals*, Vol. 4:104–109, **1957.** 4 figs. **DWB**—This article contains concise but complete instructions for two types of auroral photography to be conducted during the IGY: 1) Single station photography by amateurs or by observers (in lower latitudes) not engaged in the regular auroral program, and 2) height measurement photographs (both professional or amateur) from two or more points. The use of photometers as exposure meters in auroral photography is described. *Subject Headings:* **1. Auroral photography 2. IGY auroral program.**—*G.T.*

11.4–110 551.594.5

Hoffmeister, C., **Beobachtung von Polarlichtern auf niederen Breiten.** [Observation of polar auroras at low latitudes.] *Die Sterne*, Leipzig, 34(7/8):154–155, **1958.** fig. **DLC**—The author investigates in which latitudes auroras have been recorded. Several outstanding cases are mentioned where the aurora extended beyond the usual auroral limits (from 1859—Honolulu, to 1957—Mediterranean regions). *Subject Headings:* **1. Auroras 2. Low latitudes auroras.**—*A.V.*

11.4–111 551.594.5

Jackisch, Gerhard, **Nordlicht in der Nacht vom 31 Mai zum 1. Juni 1958.** [Polar aurora during the night of May 31–June 1, 1958.] *Die Sterne*, Leipzig, 35(3/4):85–86, **1958. DLC**—Description of the polar aurora observed at the Sonneberg Observatory on May 31, 1958 at 1 h U.T. which took the form of a red gleam in northern direction. The maximum was from 0h25 to 0h35; with full moon, cloudy sky with 6/10 Strato-Cu, and cloudless at midnight. *Subject Heading:* **1. Auroral observation.**—*A.V.*

11.4–112 551.594.5

Jarrett, A. H. and Byard, P. L. (*both, Univ. Observatory, St. Andrews, Scotland*), **On the possibility of observing aurorae in the daytime.** *Journal of Atmospheric and Terrestrial Physics*, London, 11(3/4):295–296, **1957.** 3 refs. **DLC**—Calculations of several factors (scattering, polarization, sky brightness) involved in visibility of auroras in daylight indicate that even the most intense auroras would be hard to detect from a high flying airplane at 25 km, although stars of the first magnitude are visible 2 hours after dawn and 2 hours before dusk. A special airplane flight on June 30, 1954 during a total eclipse of the sun did not detect any auroral display. Perhaps the 5577 A line might be detected. *Subject Heading:* **1. Auroral observation during daytime.**—*M.R.*

11.4–113 551.501.81:551.594.5

Kavadas, A. and Glass, D. G., **Polarization of radar echoes from aurora.** *Canadian Journal of Physics*, Ottawa, 37(6):690–697, June **1959.** 6 figs., 5 refs. **DWB, DLC**—Auroral radar echoes at very high frequency received at antennas sensitive to linearly polarized components in directions symmetrical to the plane of polarization of the vertically polarized transmitted wave and the ground plane indicate that the received wave, in addition to an unpolarized component, contains a linear component of polarization tilted in the general direction of the earth's magnetic field lines. *Subject Heading:* **1. Radar echoes from auroras.**—*Authors' abstract.* Ⓢ

11.4–114 551.594.5:551.521.67

Kolobkov, N. V., **Neobychnye poliarnye siianiia.** [Unusual northern lights.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:56–58, March **1958.** 2 figs. (maps), 3 refs. **DWB, DLC**—During September 1957 northern lights were observed four times at night, namely on Sept. 5, 22, 23 and 30, 1957. Those of Sept. 4–5 and 29–30 were characterized by their brightness, duration and unusual penetration into southern latitudes (Moldavia, Uzbek S.S.R.). Maps showing the visibility of these two northern lights are presented and a detailed description of the color development and the extent of the visibility of each of these auroras are presented. In explaining the deep penetration of these northern lights, the author discusses the relationship between auroras and terrestrial magnetism, the electrical nature of

northern lights, and their relationship to corpuscular fluxes issuing from the sun and the fluence of solar activity upon these fluxes. The northern lights of Sept. 4–5 and 29–30 a explained by the fact that the earth was in favorable situation relative to the sun and corpuscular fluxes. On those days as well as on Sept. 26, 27 and 29 bright chromosphe flares were observed; the hardness of the corpuscles and their ability to burst into the ionosph of middle and southern latitudes increased. The intensity of the corpuscular flux broug about the grandiose scale of the aurora. *Subject Headings:* **1. Auroras, U.S.S.R. 2. Co puscular radiation-aurora relationships 3. U.S.S.R.**—*I.L.D.*

11.4–115 551.594.5:551.506.

Kosibowa, Stefania (*Wroclaw Astronomical Obs.*), **Visual observations of aurorae Poland in 1957.** *Acta Geophysica Polonica*, Warsaw, 6(3):262–263, **1958.** tables. **DLC** Within the framework of the Polish IGY program, the author organized in 1957 a netwo of visual observations of auroras in Poland. Continuous participation in the observatio was declared by 2 observatories of the Institute of Geophysics, Polish Academy of Scienc 2 astronomical observatories, 12 stations of the Hydro-Meteorological State Institute and 50 amateur observers, mainly teachers; a number of reports were also made by occasion observers. The observers conducted their work in accordance with instructions of the IG Instruction Manual, edited by the Publications Committee of CSAGI, London. *Subj Headings:* **1. Auroral observation program 2. IGY aurora program 3. Polish participation IGY 4. Poland.**

11.4–116 551.594

Lipinski, St., **L'aurore boréale du 20–21 juin 1958.** [The aurora borealis on June 20–2 1958.] *L'Astronomie*, Paris, 73(3):134–135, March **1959.** 3 figs. **DLC**—Short account the aurora on June 20–21, 1958, observed by the author from the small village of Ora, In Three photos illustrate this article. *Subject Heading:* **1. Aurora of June 20–21, 1958.**—*A.V.*

11.4–117 551.594.5:551.510.535(4

Lukina, L. V., **Poliarnoe siianie 11 fevralia 1958 goda.** [The aurora of Feb. 11, 1958 *Priroda*, Moscow, No. 8:117–118, Aug. **1958. DLC**—On the night of Feb. 11, 1958, betwe 10:00 and 11:00 o'clock a large aurora was observed over the U.S.S.R.; it extended as far sou as lat. 46°N. This aurora, which was preceded by the passage of a large number of sunspo through the central meridian of the sun, was accompanied by intense magnetic storms over t entire earth. The normal condition of the F2 layer was disturbed and a sporadic E_s lay manifested itself, bright at an altitude of 60 km. The aurora extended in many places fro horizon to zenith. *Subject Headings:* **1. Auroras 2. Auroral effects on ionosphere 3. U.S.S.** —*I.L.D.*

11.4–118 551.594.5(41

McInnes, B. and Robertson, K. A., **The auroral display of Sept. 4–5, 1958.** *Brit Astronomical Association, Journal*, 69(4):167–176, May **1959.** 6 figs., 12 refs. **DWB, DLC** A brief analysis of the visual observations at Eskaldemuir and elsewhere in Great Britain given. Variations of geomagnetic elements are also considered and accompanied by magnet grams, graphs and maps. Brightness of the display estimated to take place at the 400 k level varied by time from 15, 30 and 05 m. The usual apple-green color was not as conspicuo as the red color reported by most of the observers. *Subject Headings:* **1. Auroral observatio 2. Great Britain.**—*W.N.* Ⓢ

11.4–119 551.594

La magnifique aurore boréale du 4 septembre 1958. [The magnificent aurora of Sept. 1958.] *L'Astronomie*, Paris, 72(11):469–478, Nov. **1958**; 72(12):527–528, Dec. **1958**; a 73(1):40–42, Jan. **1959.** fig. **DLC**—Accounts of a number of visual observations made France of the aurora on Sept. 4, 1958. *Subject Heading:* **1. Aurora of Sept. 4, 1958 2. Franc** —*A.V.* Ⓢ

11.4–120 551.594.5:551.510.535:621.396.8

Omholt, A., **Radio observations of aurorae.** (In: Chicago Univ. Yerkes Observatory, Williams Bay, Wisc., Contract AF 19(122)-480, Technical Report, No. 22 (**Symposium on auroral observations during the IGY, Sept. 17–26, 1956**), pub. **1956.** p. 6–12. 18 refs.) **DWB**—The possible altitudes and ionization processes which might account for radar and radio reflections from auroral streamers (associated with E_2 reflection) are discussed. The absorption of 1–20 Mc/sec waves is supposed to take place at 80 km, whereas the visible aurora is 100 km or higher. Explanation is only tentative. Radio echoes occur only with strong auroras low in N.W. and N.E. and usually with active rays. A strong fading rate and Doppler broadening indicate speeds of reflecting points up to 1000 m/sec. *Subject Headings:* **1. Radio reflections from aurora 2. Auroral drift.**—*M.R.*

11.4–121 551.594.5

Paton, James, **Aurores polaires et tropicales.** [Polar and tropical auroras.] *Schweizerische Technische Zeitschrift*, Berne, 54(40):843–847, Oct. 3, **1957.** 4 figs., 11 refs. **DLC**—Some interesting information about the properties of auroras. As correspondent of the Section for auroras and air luminescence of the National British Committee of the IGY, the author calls upon all interested people to communicate their observations on auroras. *Subject Heading:* **1. Auroras.**—*A.V.*

11.4–122 551.385.4:523.75:551.594.5

Polet, Th. W., **De poollichten van 28/29 maart en 23/24 april 1959.** [The auroras of March 28/29 and April 23/24, 1959.] *Hemel en Dampkring*, The Hague, 57(7/8):178–180, July/August, **1959.** 2 tables. **DWB, DLC**—Tables are presented of the solar eruptions observed in the Netherlands from March 22 to 27 and April 19 to 29, 1959 with indication of their importance. The characteristic magnetic recordings and phenomena from the same periods are mentioned. From these enumerations it appears that the behavior of the earth's magnetic field and the appearance of polar lights are not always linked to solar eruptions. The polar lights of March 28/29 and April 23/24 are described; whereas the former was announced by solar eruptions and a strong magnetic storm, the latter was not preceded by remarkable solar eruptions and was only accompanied by a very weak magnetic storm. *Subject Headings:* **1. Magnetic field variations 2. Magnetic storms 3. Auroras 4. Solar eruptions.**—*A.V.* Ⓢ

11.4–123 551.594.5

Ruhnow, D., **Polarlichtbeobachtung vom 11.2.1958.** [Auroral observation on Feb. 11, 1958.] *Die Sterne*, Leipzig, 35(5/6):123, May/June **1959. DLC**—Detailed report of visual auroral observations made on Feb. 11, 1958 at Rodewisch (50°32′N, 12°24′E) from 02H42 till 03H50 U.T. *Subject Heading:* **1. Auroral observation.**—*A.V.* Ⓢ

11.4–124 551.594.5 551.521.326

Siedentopf, H., **Polarlicht und Nachthimmelsleuchten.** [Polar aurora and night airglow.] *Die Naturwissenschaften*, Berlin, 46(9):309–314, May **1959.** 9 figs., 8 refs. **DLC**—A description is given of the polar aurora and of night airglow. The results of the research made in this field during the IGY by American and Russian scientists with photoelectric and spectroscopic methods are summarized. The latest discoveries of Van Allen are presented. *Subject Headings:* **1. Auroras 2. Airglow.**—*A.V.* Ⓢ

11.4–125 551.594.51:535.33

Landolt, A. U., **The auroral spectrum.** (In: Chicago Univ. Yerkes Observatory, Williams Bay, Wisc., Contract AF 19(122)-480, Technical Report, No. 22 (**Symposium on auroral observations during the IGY, Sept. 17–26, 1956**), pub. **1956.** p. 25–30. 16 refs.) **DWB**—Auroral spectra are classified according to 3 groups: 1) Molecular bands, 2) permitted atomic lines, 3) forbidden atomic lines. The known bands and lines are listed in order of wave length and the atom or molecule, and multiplet number or band indicated for each. Intensity

variations in auroral spectra are discussed; variation being according to altitude and type a well as time. Latitude effects are not marked—only hydrogen emissions are stronger in lo latitude auroras. The sunlit aurora also differs in having a less intense 5577A band and greater ultraviolet intensity. Auroral rays may change color without changing positio *Subject Headings:* **1. Auroral spectra 2. IGY auroral program.**—*M.R.*

11.4–126 551.594.5

Reid, G. C., **A magneto-ionic theory of the aurora.** *Alaska. Univ. Geophysical Institut Geophysical Research Report*, No. 4, Dec. **1958.** 16 p. 6 figs., 17 refs., 5 eqs.—A qualitativ description of the development of a typical auroral display as the result of an electrical di charge in the ionosphere is presented. The prime cause of the discharge is taken as the po tential difference existing between points in the interplanetary medium as a result of an inte action between charged particles of solar origin and the earth's magnetic field. The characte istics of the occasional very intense auroras visible over large areas of the earth are discusse as well as the normal diurnal and seasonal variation of auroral occurrence. The origin of th electric field is discussed, and a possible explanation in terms of particles trapped in the earth magnetic field is presented. *Subject Headings:* **1. Auroral theories 2. Magneto-ionic theory** —*Author's abstract.*

11.4–127 551.594.52 (98

Fel'dshteĭn, Ia. I. **Raspredelenie poliarnykh siianiĭ v okolopoliusnoĭ oblasti.** [Th distribution of auroras in the circumpolar region.] *Akademiia Nauk SSSR, Izvestiia, Se Geofiz.*, No. 1:170–171, Jan. **1959.** fig., 5 refs. **DLC**—In the Dickson Island Observatory the author analyzed the geographical distribution of the auroras in the western part of th Soviet Arctic on the basis of data of polar stations situated between long. 50–110°E. I appeared that the form of several frequency diagrams of auroras according to different azimut of the polar station of Rudolph Island ($\phi = 72°.4$), Nagurskaia Bay ($\phi = 72°.3$), Tikhaia Ba. ($\phi = 71°.5$) and also the latitudinal distribution of the frequency of appearance of auroras i the morning hours indicates the existence in latitudes of the order $\phi = 78°$ of a second zone auroras. In the U.S.S.R. the supposed second zone indicated indirectly why appearance auroras in the zenith passes through Central Asia. A graph giving the distribution of aurora as a function of geomagnetic latitude during the winter of 1955/56 based upon data of sever polar stations, including the drift station SP-5, is presented and analyzed. In the region of th second polar zone are available only the observations of station SP-5. The probability appearance of auroras amounts to 27.4 and 18.4% corresponding to stormy and quiet days The considerably lower probability of occurrence of auroras in the region of the second zon supports the theoretical observations of ALFVÉN on the lower intensity of electronic processes i the second zone in comparison to the fundamental polar aurora. *Subject Headings:* **1. Pola incidence of aurora 2. Auroral distribution.**—*I.L.D.* Ⓢ

3. AIRGLOW

See also: **Night sky spectroscopy** (Connes, Gush), **11.4–247.**

11.4–128 535.33:551.521.32

Barbier, Daniel and Glaume, Jeannine, **Contribution à l'étude de la structure de la couch qui émet la raie 5577 du ciel nocturne.** [Contribution to the study of the structure of the laye emitting the 5577 line of the night sky.] *Annales de Géophysique*, Paris, 15(2):266–271, Apri June **1959.** 6 figs., 10 refs. **DLC**—A statistical study is presented on the emission layer of th green line of the night sky. At the Haute-Provence Observatory, the emission of 5577 is on th average more intense in the south than the north. The opposite exists only in June, July, Au gust and November. This result is confirmed by comparison with observations made a Tamanrasset and in the U. S. Maximum lines are rather frequently observed, in particular o the north of the observatory of Haute-Provence. *Subject Headingss:* **1. Night airglow emissio 2. Emission line 5577A 3. Emission layer structure 4. Haute-Provence Observatory, France** —*A.V.* Ⓢ

11.4–129 535.33:551.521.326:551.593.55

†Barbier, Daniel (*Inst. d'Astrophysique*), **Recherches sur la raie 6300 de la luminescence atmosphérique nocturne.** [Research on the 6300 line of the night airglow.] *Annales de Géophysique*, Paris, 15(2):179–217, April/June **1959.** 17 figs., 14 tables, 30 refs., eqs. French and English summaries p. 179. **DLC**—A large number of observations made at the Haute-Provence and Tamanrasset Observatories are discussed. Results, some of them entirely new, are as follows: 1) Existence of a twilight phenomenon, which can be observed in the direction of the azimuth of the sun, as long as it is no more than 28°–30° under the horizon. This could be due to radiative dissociation of O_2, whose scale height, in the 250–300 kms range of altitudes, must be around 70 km. During periods of solar activity, twilight emission is often very strong. 2) Electronic radiative recombination explains the intensity decrease observed at the beginning of the night. Mean height is 275 km. By comparison with ionospheric measurements, the O_2 scale comes out to be 80 km. These results are valid during the winter months only. 3) The increase of intensity during the second half of the night is associated with a propagation along the geomagnetic meridian. Its mean height is 230 km. 4) Bursts of intensity are sometimes observed during summer at the low altitude station of Tamanrasset. In winter there are so many of these bursts that the variation of intensity in Tamanrasset has a completely different character from the variation observed at the Haute-Provence Observatory. 5) The intensities 5577 and 6300 Å do not show any correlation at the Haute-Provence Observatory. It is not out of the question that bursts in Tamanrasset could have a weak counterpart in other radiations. *Subject Headings:* **1. Twilight phenomena 2. Twilight luminescence spectra 3. Night airglow 4. Emission line 6300 A 5. Haute Provence Observatory, France 6. Tamanrasset Observatory, Algeria.**—*Author's abstract.* Ⓢ

11.4–130 535.33:551.521.326

*Dufay, Maurice, **Etude photoélectrique du spectre du ciel nocturne dans le proche infrarouge.** [Photoelectric study on the spectrum of the night sky in the near infrared.] *Annales de Géophysique*, 15(2):134–152, April/June **1959.** 10 figs., 5 tables, 30 refs. French and English summaries p. 134. **DLC**—Spectra of the night sky and of auroras in the near infrared have been obtained, using a scanning spectrometer equipped with a rotating grating and a Gallemand photomultiplier (refrigerated Cs-O-Ag photocathode). The sensitivity of this apparatus is sufficient to obtain recordings of the 0.7–1.1μ region with a spectral slit of 15 Å and a scanning period of 45 min. Relative intensity measurements of the OH bands in this region are in reasonable agreement with the predicted intensity, except for the $v'=9$ vibrational level. The intensity distribution in the P branches corresponds to a rotational temperature of 250°K, in good agreement with other determinations. Nightly and seasonal variations of emission intensity were observed in the course of the year 1957. A noticeable correlation between intensity of the O_2 0−1 "atmospheric" band (8640 Å) and the [OI] 5577 Å green line was noted. Several low latitude auroras were studied with the same instrument. The detected emissions were principally atomic lines of OI and NI. The forbidden $^2D-^2P$[NI] (10400 Å) and $^2D-^2P$[OII] (7320 Å) doublets were also observed with relatively great intensity. *Subject Headings:* **1. Night sky spectra 2. Near infrared night sky emission 3. Night airglow instruments 4. OH band intensities 5. O_2 0−1 band intensities.**—*Author's abstract.* Ⓢ

4. IONOSPHERE

See: **Bibliog. on Ionospheric Physics,** p. 584.

5. COSMIC RAYS

See also: **Cosmic radioisotopes for studying general circulation** (Lal), 11.4–234.

11.4–131 551.510.4:551.571:551.521.64

Arakawa, Hidetoshi (*Met. Res. Inst., Tokyo*), **Cosmic-ray intensities and liquid-water content in the atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(6):625–629, June **1959.** 9 figs., table, 9 refs. **DWB, DLC**—Cosmic ray intensity data have been studied

in Japan, and it has been found that passages of cold fronts do not produce a pronounc variation in cosmic ray intensities. Warm fronts produce a gradual but pronounced decreas Further evidence from the decrease in neutron counts accompanied by little change in ionizati chamber records substantiates the conclusion that the variations are due to liquid wat content of the atmosphere. Estimates of as much as 50 to 70 mm of liquid water in the a mosphere are supported by records of tremendous rainfall during the passages of typhoon *Subject Headings:* **1. Liquid water content of atmosphere 2. Cosmic ray intensities 3. Japa** —*Author's abstract.* Ⓢ

11.4–132 551.521.64:551.508.

Baradzeĭ, L. T.; Solov'ev, M. V.; Tulinova, Z. I. et al., **Spektr impul'sov chastits zhestk komponenty kosmicheskikh lucheĭ na vysote 9000 m.** [Pulse spectrum of particles of th hard component of cosmic radiation at 9000 m.] *Zhurnal Eksperimental'noĭ i Teoreticheskĭ Fiziki*, Moscow, 36(6):1617–1620, June **1959.** 6 figs., 7 refs. Russian summary p. 161 English summary p. 1620. **DWB**—With aid of a cloud chamber in a magnetic field the momen tum spectrum of particles of the hard component of cosmic rays has been obtained at a altitude of 9 km for momentum values lying between $0.3 \cdot 10^9$ and $6 \cdot 10^9$ eV/c. In the indicat momentum range the particles were separated with respect to charge. It is found that in th $(1-5)10^9$ eV/c momentum range protons comprise $50 \pm 10\%$ of the total number of particle *Subject Headings:* **1. Hard cosmic rays 2. Cloud chamber studies 3. Cosmic ray spectru I. Filatova, L. I.**—*Authors' abstract.* Ⓢ

11.4–133 551.521.64:550.3

Demers, Pierre (*Faculté des Sciences, Univ. Montréal*), **Quelques aspects du rayonnemen cosmique en géophysique.** [Some aspects of cosmic radiation in geophysics.] *Bulletin Géophysique*, Montreal, No. 5:16-20, April **1959. DWB**—The origin of cosmic particles an rays is been discussed with particular reference to their effects on earth satellites as well as c other earth phenomena. The hypotheses of origin are based on solar and geomagnetic factor Their intensity in any particular part of the globe is enhanced by geographic factors. Prob lems associated with cosmic rays are discussed. *Subject Headings:* **1. Cosmic ray origi 2. Geomagnetic effects on cosmic rays.**—*N.N.* Ⓢ

11.4–134 551.507.362.2:551.521.6

Dobrotin, N. A., **Issledovaniia kosmicheskikh lucheĭ pri pomoshchi iskusstvennyk sputnikov Zemli.** [Cosmic ray studies by means of artificial earth satellites.] *Priroda* Moscow, No. 1:5764, Jan. **1959.** 5 figs. **DLC**—The information on cosmic rays obtaine from the third Soviet and fourth U. S. satellites is summarized. A perceptible increase i cosmic ray intensity is associated with a height of 400 km. This increase in the interval 400 700 km is the result of diminished screening by the earth and the reduced deflection by th earth's magnetic field. Data provided by the satellites show that the position of the "cosm equator" differs markedly from that of the geomagnetic equator and that the distribution o the magnetic field at great distances from the earth does not correspond with that at the surfac The intensity of cosmic radiation showed sudden increases above the mean recorded at time when such bursts were unobserved at station at the earth's surface. With the aid of a Čerenko counter installed on the third Soviet satellite, the magnitudes of streams of heavy nuclei i primary cosmic radiation were established and it was shown that this radiation does not contai a significant number of nuclei of atoms of the middle of the periodic system. With the ai of a charged gaseous counter and a scintillation counter installed on satellites it was show that in the polar regions, and especially at elevations of the order of 1500 km in the equatoria region, extremely intense electron currents and photons of low energies are present. Th observed radiation at this altitude is so large that it overloads the charged gas counter and th scintillation counter and it is considered as consisting of particles of terrestrial origin havin relatively small energies. Together with the intense equatorial radiation there was observe a substantial increase in the number of particles recorded by the counter in the polar regio north of lat. 60°N; in the opposite direction their number diminished. The energy of th electrons producing ionization in the scintillation counter is estimated at 200–300 kev. Als the so-called aureole of charged particles around the earth was discovered by Van Alle

ubject Headings: **1. Satellite cosmic ray observation techniques 2. Cosmic ray events at igh altitude.**—*I.L.D.* Ⓢ

11.4–135 551.521.64

Fenton, A. G. (*Nat'l. Res. Coun., Ottawa, Canada*); McCracken, K. G. (*Dept. Physics, Univ. Tasmania*); Rose, D. C. and Wilson, B. G. (*both, Nat'l. Res. Coun., Sulphur Mount. Lab., Banü, Alberta*), **Transient decreases in cosmic ray intensity during the period October 1956 to January 1958.** *Canadian Journal of Physics*, Ottawa, 37(5):569–578, May **1959.** figs., 4 tables, 11 refs. **DWB, DLC**—Recent nucleon intensity data obtained from high counting rate recorders at Ottawa and Hobart, and subsidiary stations, have been examined for evidence for the superposition of transient decreases. It is concluded that, with the statistical accuracy now available due to the high counting rates, it is possible to distinguish two types of transient decreases in the observed variations, superimposed upon the slower 11-year intensity changes. One of these is an almost symmetrical event lasting up to 2 weeks and exhibiting a recurrence tendency of about 27 days, while the other is the more abrupt Forbush decrease which recovers over a period of several days. The evidence indicates that the intensity-controlling mechanism responsible for these short-term transient changes is able to influence the cosmic ray flux at the earth independently of other events that may be in progress at the time. There is also evidence that the physical process controlling the Forbush type of decrease operates over a volume large compared with the earth because the intensity changes at places as far apart as Ottawa, Canada, and Hobart, Tasmania, show changes that are the same within the accuracy of the measurements. *Subject Headings:* **1. Cosmic ray decreases 2. Canada 3. Tasmania.**—*Authors' abstract.* Ⓢ

11.4–136 551.521.64

French, W. R., Jr. and Chasson, R. L. (*both, Univ. of Neb., Lincoln, Neb.*), **Atmospheric effects on the hard component of cosmic radiation near sea level.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):1–18, April **1959.** 2 figs., 9 tables, 25 refs., 2 eqs. **DLC**—Atmospheric effects on the hard component of cosmic radiation were studied at Lincoln, Neb. (51°N geomag. lat.; 350 m altitude) with narrow- and wide-angle Geiger counter telescopes (20 cm Pb absorber). Intensity measurements were made from 1 Sept. 1953 through 16 Feb. 1956, and linear regression analyses were carried out for several possible combinations of atmospheric variables and the cosmic ray intensity. A detailed comparison is made of the results obtained from triple regression calculations based upon the 50 mb, 100 mb and 200 mb Duperier models and the Olbert model. It is found that the 50 mb Duperier model is superior to all others tested, but the extent to which the intensity can be corrected by statistical methods is limited at present by the accuracy of the radiosonde data. Experimental results are in good general agreement with those of other investigators and agree well with the theoretical predictions of Trefall with regard to the temperature effect. They are in poor agreement with the predictions of Trefall on the barometric effect, however, and do not substantiate the theoretical conclusions of Olbert. The smoothing of the intensity curves seems to be practically indifferent to the terms employed in the regression equation if it involves three or more atmospheric variables. *Subject Headings:* **1. Atmospheric effects on cosmic rays 2. Hard cosmic rays 3. Cosmic ray variations at sea level.**—*Authors' abstract.* Ⓢ

11.4–137 551.521.64

Kodama, Masahiro (*Inst. of Phys. & Chem. Research*), **World-wide distribution of cosmic-ray neutron intensity at sea level.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 10(2): 37–46, **1959.** 12 figs., table, 15 refs. **DWB**—The world-wide distribution of cosmic ray intensity at sea level was decided from the several latitude surveys so far carried out by many researchers. The contour map thus obtained was compared with the various models for the earth's geomagnetic field. *Subject Headings:* **1. Cosmic ray variations at sea level 2. Cosmic ray neutrons.**—*Author's abstract.* Ⓢ

11.4–138 523.16 551.521.64

Schopper, E., **Elementarteilchen in der kosmischen Strahlung.** [Elementary particles in cosmic radiation.] *Die Naturwissenschaften*, Berlin, 46(9):290–295, May **1959.** 10 figs.,

20 refs. **DLC**—The terrestrial atmosphere receives a permanent flow of particles from cosmi radiation. The author gives the percentage of the different particles according to their natu and describes the formation process of nucleons, mesons and hyperons. Measurement metho in nuclear physics are presented and the research of BLACKETT, RUMBAUGH, LOCKER, WILKIN and SCHOPPER mentioned. The author gives a historical survey of different discoveries fro 1932 to the discovery of the π meson in 1947 by POWELL-OCCHIALINI. Rockets have made possible to carry out more intensive research in this aspect of physics. *Subject Heading* **1. Cosmic ray particles 2. Cosmic ray origin.**—*A. V.* Ⓢ

11.4–139 551.521.64:551.507.362

Vernov, S. N.; Chudakov, A. E.; Gorchakov, E. V. et al. (*all, Academy of Science U.S.S.R.*), **Study of the cosmic-ray soft component by the 3rd Soviet earth satellite.** *Planetar and Space Science*, N. Y., 1(2):86–93, April **1959.** 6 figs. **DWB**—Measurements made wit a scintillation counter installed on the 3rd Soviet earth satellite are presented. With th instrument the counting rate corresponding to the energy greater than 35 kev and the tota ionization in the scintillator were measured. Two zones of high intensity radiation are ob served. The first one is observed at latitudes greater than 60° and altitudes above 300 km Radiation in this "polar zone" consists of electrons of energy about 100 kev and flux rate 10^2 to 10^4 particles/cm^2 sec sterad (increasing with altitude). The second zone is observed a altitudes about 1000 km and latitudes not exceeding 50°, in this "equator zone" the ionizatio in the scintillator is 3 orders of magnitude greater than that due to cosmic rays. Stron dependence on latitude and longitude is assumed to be consistent with the symmetry of th zone relative to the inclined and displaced geomagnetic axis. Lower limits are given for th γ-radiation from the Sun. *Subject Headings:* **1. Soft cosmic rays 2. Satellite cosmic ra measurements 3. Satellite cosmic ray recorders 4. Scintillation counters. I. Logachev J. L. II. Vakulov, P. V.**—*Authors' abstract.* Ⓢ

6. ZODIACAL LIGHT AND VAN ALLEN BELT

11.4–140 523.59(62):551.506.22

Fesenkov, V. G., **Ekspeditsiia AN SSSR v Egipetskiĭ raĭon OAR dlia nabliudeniia zodia kal'nogo sveta.** [Expedition of the Academy of Sciences of the U.S.S.R. to the Egyptian are of the United Arab Republic for observation of zodiacal light.] *Akademiia Nauk SSSR Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG (IGY), Informatsionnyĭ Biulleten'*, No 5:82–85, **1958. DWB**—The program of the expedition to study the zodiacal light in the vicinity of Aswan, where it may be observed twice a day—before sunrise when it is almost perpendicular to the horizon and in the evening after twilight. The Soviet and Egyptian personnel are listed, the apparatus, program of observations and conditions of observation are described and the preliminary results are presented. Observations with an electric photometer and visual binocular photometer showed that the zodiacal light follows very closely the ecliptic and is about 20% polarized. The isophotographs of the morning branch are oriented normal to the horizontal and appear compressed towards the ecliptic; the nocturnal branch, primarily north of the ecliptic, forms with it a considerable angle. The morning branch of the zodiacal light corresponds to the true zodiacal light. It was found that the zodiacal light is almost exclusively the result of light scattering by dust particles continually arriving in interplanetary space as a consequence of the gradual decomposition of asteroids and to some extent of the decay of comets. The evidence for the asteroidal and comet origin of the zodiacal light and for the fact that the light is not of electronic but rather of aerosol or dust origin is presented. *Subject Headings:* **1. Zodiacal light 2. Soviet participation in IGY 3. Egypt.**—*I. L. D.*

11.4–141 551.521.32:551.521.6

Singer, S. Fred, **Corpuscular radiation environment of the earth.** Presented at the American Rocket Society Controllable Satellites Conference, MIT., April 30–May 1, **1959** Issued as *U. S. Air Force. Cambridge Research Center, TN*-59-296, **1959.** 11 p. 3 figs. table, 14 refs. **DWB** (M21.32 S617co). Also issued as: Maryland. Univ. Dept. of Physics Contract AF 19(604)-3861, [Unnumbered Report], **1959.** 11 p. 3 figs., table, 14 refs. **DWB**

From the point of view of space flight, two types of phenomena are of importance in the vicinity of the earth: 1. the trapped particles which make up the earth's radiation, and 2. the primary cosmic radiation. We discuss in detail problems which arise in connection with the earth's radiation belt. There are in reality two radiation belts which coexist in the earth's magnetic field as trapped particles: one is soft and of solar origin, the other is hard and of cosmic origin. The latitude and altitude distribution is different for two types, and so is the nature of the radiation, and therefore the shielding problem. Shielding is very difficult for the hard radiation belt; large thicknesses of material are needed to reduce the radiation level to a tolerable value. It may therefore be promising to reduce the radiation belt intensities by eliminating the particles themselves through operation of satellites which "sweep" the space around the earth by absorbing the particles which hit them. Against high energy primary cosmic rays (consisting of protons and heavier nuclei) shielding may be of no avail; however, the intensities involved should be small. Shields of hydrocarbons turn out to be most effective against heavy primaries by producing fragmentations which break up the incident heavy nucleus into smaller particles, the ionization density is thereby considerably reduced, and so is the biological effectiveness. But cosmic ray increases following solar flares can be fatal. *Subject Headings:* **1. Solar radiation 2. Cosmic radiation 3. Radiation belts 4. Primary cosmic rays. I. Maryland. Univ. Dept. of Physics II. Contract AF 19(604)-3861.** —*Author's abstract.* Ⓢ

7. WHISTLERS

11.4–142 551.594.6

de Jager, C., **Het verschijnsel der "whistlers."** [Whistler phenomenon.] *De Meteoor*, Utrecht, 14(2/3):25–29, May/July **1958.** 2 figs.—A review is made of whistler phenomena. The observation method is described and a diagram of an instrument for the analysis of the noise frequencies is shown. An interpretation is made of the different kinds of whistlers. *Subject Headings:* **1. Whistlers 2. Whistler observation techniques.**—*A. V.*

11.4–143 551.594.6

Kimpara, Atsushi, **Diurnal and seasonal variations in whistler records in Japan.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 6:38–43, Jan. **1959.** 3 figs., 2 tables. **DWB**—This is a preliminary short report on whistlers observed in Japan for one year during IGY from 1 July, 1957 to 30 June, 1958. Observations were made at Wakkanai (geogr. N 45°22′, E 141°41′; geomag. 35.3°, 206.0°) and at Toyokawa (geogr. N 34°50′, E 137°22′; geomag. 24.5°, 203.5°) at 5–7 min and 35–37 min every hour (U.T.). *Subject Headings:* **1. Whistlers 2. Japan.**—*Author's abstract.* Ⓢ

11.4–144 551.594.6

Maeda, Ken-ichi and Kimura, Iwane (*Dept. of Electronic Eng., Kyoto Univ.*), **Calculation of the propagation path of whistling atmospherics.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):58–65, Sept. **1959.** 2 figs., 4 refs., 18 eqs. **DLC**—An approximate method is worked out for calculating the propagation path of a whistler by using Fermat's principle. The paths calculated under some appropriate assumptions of the electron density distribution above the ionosphere show appreciable deviations from the line of magnetic force and are generally asymmetric with respect to the magnetic equator. As to the frequency characteristics of the whistler path, the higher the wave frequency, the lower the wave path. *Subject Headings:* **1. Whistlers 2. Sferics propagation.**—*Authors' abstract.* Ⓢ

8. ASTRONAUTICS—SATELLITES AND ROCKETS

See also: **Satellite cosmic ray measurement** (Vernov et al.), 11.4–139; **Atmos. models based on rocket and satellite data** (Kallmann), 11.4–222.

11.4–145 551.507.362.1:522.61 551.507.321:523.743:778.3

Bruzek, A., **Die Überwindung der Erdatmosphäre in der Astronomie.** [Overcoming the earth's atmosphere in astronomy.] *Umschau*, Frankfurt, a.M., 59(6):181–183, March 15,

1959. fig., 5 refs. **DLC**—New knowledge obtained by high altitude balloon and rocket-borne instruments in the U. S. is reported here. Excellent photos of the sun's granulation, smallest cell of which is estimated to be about 200 km diameter, were taken at 28 km altitude. Several intensive radiation regions of UV nebula were discovered March 28, 1957 by means of four rocket-borne photon counters at 146 km altitude. A fundamental problem is determination of the exact point of measurement aloft but an accuracy of 1° was obtained by aid of 12 photometers. The radiated energy of the order of 10^{37} erg/sec is inexplainable by the classical theories on gaseous nebula. The diffuse sky light above and below 146 km altitude hampers observations somewhat. In the Lyman α region this sky light is due to interplanetary H rather than remanents from the earth's atmosphere. *Subject Headings:* **1. Rocket photographs of the sun 2. Astrophysical observations from rockets.**—*W. N.* Ⓢ

11.4–146 551.507.362.1:551.557

Faust, Heinrich (*Offenbach/M*), **Windmessung mit Raketen in Kap Canaveral.** [Wind measurements at Cape Canaveral with rockets.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(7):273, July **1959. DWB, DLC**—Gerhard Reissig, Chief, Aeroballistic and Geophysical Group of U. S. Army Ballistic Missile Agency at Huntsville, Ala., developed a method for measuring height of winds by rockets. The approximately 30 rockets at Cape Canaveral reaching the stratosphere gave many more details of the registered wind profiles than the simultaneously launched balloons and sondes did. Strong wind fields, depending on seasons, were discovered in the stratosphere. *Subject Headings:* **1. Rocket measurement of wind 2. High level wind measurement techniques 3. Cape Canaveral Fla.**—*O. Taborsky.* Ⓢ

11.4–147 551.507.362.1:629.136.5

Moureu, H., **Aspect actuel des problèmes concernant les fusées.** [Present status of problems concerning rockets.] *Schweizerische Technische Zeitschrift*, Berne, 55(7):121–131, Feb. 13, **1958.** 10 figs., 5 tables, eqs. **DLC**—The author describes scientific principles for creating extremely high velocities indispensable for study of the different problems which can be resolved only by rockets (high altitudes, artificial satellites, astronautics, etc.). Different research on autopropulsion, aerodynamics and aerothermics and guiding are mentioned. *Subject Heading:* **1. Rockets.**—*A. V.*

11.4–148 551.507.362.1

Post, C. C., **580/600 Mc notch-excited fin antenna for Aerobee-Hi rocket.** New Mexico College of Agriculture and Mechanic Arts. Physical Science Laboratory, Contract 19(604)-409, Scientific Report, No. 5, July 9, **1957.** 16 p. 13 figs. (incl. photos), 4 refs.—A notch-excited fin antenna to operate over a frequency range of 580/600 Mc was designed for the Aerobee-Hi rocket. Measurements on the pro-type antenna matched to a 50 ohm coaxial transmission line show a voltage standing wave ratio of less than 2:1 over a frequency range from 560 Mc to 650 Mc. To simplify the fin structural re-design problems, an antenna location was chosen on the fin similar to that used for the 227 Mc notch-excited Aerobee-Hi fin antenna. Far field patterns were measured and constant power contour plots were made. These measurements show more variations in the far field pattern lobe structure than notch antennas designed for the lower frequencies. Measurements were carried out with the antenna and a partial-fin mounted in a vacuum bell jar and driven by a 40 watt CW radio frequency source operating at 590 Mc. A curve showing RF breakdown power versus altitude was obtained. *Subject Headings:* **1. Aerobee-Hi rockets 2. Rocket antennas.**—*Author's abstract.*

11.4–149 551.507.362.1:523.74

Rocket flare patrol program. *American Geophysical Union, Transactions*, 39(1):165–167, Feb. **1958.** table. **DWB, DLC**—Summary of the scientific results of the rocket flare patrol program, giving the dates, altitude in feet, physical appearance of the sun, data obtained and comments on particular observations. Advances in rocket launching have now led to a perfect telemetering performance on all flights because of the use of the new type of aerodynamic telemetering antenna, with uniform radiation pattern. Several scientific rocket results correlated with direct solar observations have proved real and practicable. *Subject Headings:* **1. Solar flare observation from rockets 2. Rocket observation of sun.**—*N. N.*

11.4–150 551.510.536:551.594.13 551.507.362.2:551.506.22

Nicolet, M., **Nouvelles de l'espace.** [Space news.] *Ciel et Terre*, Brussels, 75(3/4):91–107, March/April **1959.** 4 figs. **DLC**—Account of the results obtained by means of artificial satellites during the International Geophysical Year as concerns high atmosphere. First of all, author discusses dissociation and recombination of oxygen and nitrogen molecules in upper atmosphere, where motions of charged particles are bound to the earth's magnetic field. A table shows the main peculiarities of the satellites launched up to March 1959. Diminution of satellite's orbit, owing to decrease of speed caused by atmospheric density, is discussed. The proportion of change in satellite's orbit shows that the irregularities in density of air result principally from fluctuations in solar radiation. Data relating to the changes in density within thermosphere and influence of the rise of temperature upon the increase in density are given. Densities observed and their fluctuations show that the thermal gradient at 150 km is >10° per km and may reach values such as 30° and 40° per km. Results obtained by means of satellites and whistlers show that ionization decreases very slowly with altitude beyond the maximum, in the range of 10^6 electrons per cm^3, of the F2 region. They show that there is no propagation about the equator and that the phenomenon follows the lines of force going from one hemisphere to the other. Comments on the artificial geomagnetic and radioelectric effects caused through thermonuclear explosions, and more particularly on the artificial creation of temporary radiation zones at altitudes of 10,000 km or so are included. *Subject Headings:* **1. Upper atmosphere 2. Atmospheric density 3. Dissociation and recombination of oxygen and nitrogen molecules 4. Ionization 5. Satellite observation 6. IGY, 1957–1958.**—*A. V.*

11.4–151 551.507.362.2:551.506.22

International Geophysical Year. U. S. National Committee. Technical Panel on the Earth Satellite Program, **Research in outer space: the basic objectives of a continuing program of satellite research are outlined.** *Science*, Wash., D. C., 127(3302):793–802, April 11, **1958. DWB, DLC**—The international expansion of the rocket sounding program and the launching of artificial earth satellites have led to great expectations for the scientific exploration of outer space and the planets. Many prospective achievements of satellites are discussed here. It is hoped that with advanced satellite experiments selective, as well as directional, thermal radiation will be measured. Other possibilities listed are: measurement of selective and directional ultraviolet and X-ray, collection of astronomical spectrograms, ultraviolet photographs of the sun, planetary spectrograms, experimental tests of the general theory of relativity, micrometeoric samples and solar radio noise in the high-frequency spectrum. Investigations of the moon in its mass, gravity, pressure and density of its atmosphere, as well as observations at its points of impact are anticipated. Manned interplanetary flights and interplanetary communications are envisaged. *Subject Headings:* **1. IGY satellite program 2. Satellite uses.**—*N. N.*

11.4–152 523.40 629.19

Meeus, J. **De eerste kunstmatige planeet.** [The first artificial planet.] *De Meteoor*, Utrecht, 15(1):2–4, Feb. **1959.** 2 figs.—A description is given of the varying speeds of the first Russian artificial satellite. A fig. shows the track of the artificial planet in the earth-moon system, and another figure shows the paths of Venus, Earth, Mars and the Russian planet. *Subject Headings:* **1. Soviet satellites 2. Sputnik I.**—*A. V.* ⑤

11.4–153 778.37:629.19

Land, G., **Het fotograferen van kunstmanen.** [Photographs of artificial satellites.] *De Meteoor*, Utrecht, 14(1):6–8, April **1958.** 2 photos.—Two photos of Sputnik II passing through the constellation Taurus, taken with a Rolleicord camera, are shown. Directions are given for taking photos of artificial satellites. *Subject Headings:* **1. Satellite observatories 2. Photographic determination of satellite position 3. Sputnik II.**—*A. V.*

11.4–154 778.37:629.19

van der Laan, J. J., **Fotografische positiebepalingen van Spoetnik 2.** [Photographic determinations of the position of Sputnik 2.] *De Meteoor*, Utrecht, 14(2/3):16–20, May/July

1958. 2 photos. —Accurate photographic determination of the position of Sputnik 2 wer carried out by the author. He describes his observations and the material used. *Subje Headings:* **1. Satellite tracking 2. Sputnik II 3. Photographic determination of satellit position.**—*A. V.*

11.4–155 629.1

Zeeman, J., **Het grafisch voorspellen op lange termijn van de perioden van zichtbaarhei in Midden-Nederland van door de zon verlichte (niet meer door mensen bestuurde) kunst manen, die op geringe afstand om de aarde cirkelen.** [Long term graphical predictio of the periods of visibility in central Netherlands of artificial satellites (no longer directed b man), lighted by the sun and circling at a small distance around the earth.] *De Meteoor* Utrecht, 15(2):19–26, April **1959.** 6 figs.—A graphical method is described to predict th visibility of artificial satellites. Examples are elaborated for Sputnik III, 1958 δ2, which will be visible in April and May and in July–August 1959. The prediction is inaccurate because astronomical mechanics are not applied. *Subject Headings:* **1. Satellite observation 2. Long term prediction of satellite visibility 3. Graphical method of satellite prediction 4. Sputnik III 1958 δ2.**—*A. V.* Ⓢ

11.4–156 523.40 629.19

van Woerden, H., **Kunstplanetoide 2.** [Artificial planetoid 2.] *Hemel en Dampkring* The Hague, 57(5):125–126, May **1959. DWB, DLC**—Some data (taken from *Nature*, March 14, **1959**) of the orbit of the American artificial planetoid Pioneer 4 are given. In addition, the article contains some concise information about the four-stage rocket, the aspect of the planetoid and some of the instruments it contained. *Subject Headings:* **1. Artificial planetoid 2. Pioneer IV.**—*A. V.* Ⓢ

11.4–157 523.4:629.19

Baker, Robert M. L., Jr. (*Aeronutronic Systems, Inc., Glendale, Calif.*), **Navigational requirements for the return trip from a space voyage.** *Navigation*, Los Angeles, Calif., 6(3): 175–181, Autumn **1958.** 7 figs., 3 refs., 5 eqs. **DWB, DLC**—The navigational requirements for a return trip from a space voyage are: 1) the capabilities of man to control the aerodynamic regime, 2) the problems associated with re-entry from space orbits and 3) a thorough application of meteorological data. The author presents the mathematics involved in the venture. Some safe and efficient breaking-ellipse techniques are illustrated here. *Subject Headings:* **1. Interplanetary flights 2. Re-entry problems.**—*N. N.*

11.4–158 551.507.362:551.510:531.36

Heat in high places. *Shell Aviation News*, London, Paris, No. 241:14–15, July **1958.** 3 figs. **DWB**—The NACA Research Memorandum by ALLEN and EGGERS, who developed a simplified but fundamental approach to the problem of minimizing aerodynamic heating of missiles and hypersonic aircraft when re-entering the earth's atmosphere, is discussed. An important parameter in the design of a re-entry body is

$$B = \frac{C_d A}{m \sin \gamma},$$

where C_d = drag coefficient, A = reference area for drag-evaluation, m = mass of the body, γ = the angle that the flight path makes with the horizontal. This B factor is the drag to weight ratio of the body and is connected with the authors' definition of a relatively light or heavy body. A body with variable drag is suggested. A high B value would exist in the higher atmosphere, decelerating the re-entry body; the B factor would then decrease as the drag decreased and a desired velocity history could be achieved. *Subject Headings:* **1. Missiles 2. Re-entry temperatures 3. Aerodynamic heating in high atmosphere.**—*A. V.*

11.4–159 613.693:629.19

Flickinger, Don (*U.S.A.F.*), **Biomedical aspects of space flight.** *U. S. Air Force. Air Research and Development Command, Office of Information Service, Release* No. 29–59, March

16, 1959. 23 p. mimeog. **DWB** (M07.362 F621bi)—General remarks by FLICKINGER on metabolic aspects, anthropological considerations, instrumentation, biological hazards, psychological hazards, communications, weightlessness, and other aspects of manned orbital flight in the near future. *Subject Headings:* **1. Space biology 2. Biomedical aspects of space flight.** —*M.R.* Ⓢ

11.4–160 629.19

Jenness, James R., Jr. (*Haller, Raymond, and Brown, Inc. State Coll., Penn.*), **The effect of surface coatings on the solar radiation equilibrium skin temperature of an earth satellite.** *Solar Energy*, Phoenix, Arizona, 2(3/4):17–20, July/Oct. **1958.** 4 figs., 5 refs., 5 eqs. **DWB**—The skin temperature of an earth satellite is governed mainly by equilibrium between absorbed solar radiation and re-emitted infrared radiation. A polished metal surface will reflect a large portion of the incident solar radiation but will give a relatively high skin temperature because its infrared emissivity is low. A coating of white nonmetallic material will give a lower skin temperature, even though it absorbs a greater portion of the incident solar radiation, because its infrared emissivity is much greater. *Subject Heading:* **1. Satellite skin temperature.**—*Author's abstract.*

11.4–161 629.19

Koning, P. A., **Het helderheidsverval van kunstmanen.** [The decay of brightness of an artificial satellite.] *De Meteoor*, Utrecht, 14(1):9–11, April **1958.** 2 figs., table. English summary.—The brightness of a spherical artificial satellite is computed as a function of phase angle, zenith distance and geometrical distance. *Subject Headings:* **1. Satellite observatories 2. Satellite brightness.**—*Author's abstract.*

11.4–162 551.507.7

McLardie, M. D., **Signal Missile Support Agency Missile Geophysics Research Tower.** *U. S. Signal Missile Support Army Agency, Technical Memorandum*, No. 588, Jan. **1959.** 23 p. 14 figs., 4 tables, 12 refs. **DWB** (M07.7 U582si)—The report discusses the various studies and operational projects being supported by the Signal Missile Support Agency Research Tower, White Sands Missile Range, operated by the Missile Geophysics Division. Certain limitations found in accepted methods employed at the Tower, led to the development of new methods, and in some cases new instrumentation, with resultant greater accuracy and speed in collecting the data. Function of the various instruments, and their locations on the Tower, are explained and illustrated. *Subject Headings:* **1. Tower observations 2. White Sands, N. Mex.**—*Author's abstract.* Ⓢ

11.4–163 530.12:523.4:629.19

Pierce, J. R. (*Bell Telephone Labs., Murray Hill, N. J.*), **Relativity and space travel.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(6):1053–1061, June **1959.** 6 figs., 5 refs., 81 eqs. **DWB**—This paper treats in terms of the special theory of relativity: a "clock paradox" involving the fact that the frequency of an atomic oscillator on a moving body is lowered but the mass which is converted into radiation is increased; the case of the twin who goes on a space trip at near-light speed and returns younger than his brother on earth; the shift in frequency in the presence of a gravitational field; the clock rate on a satellite; the speed attainable by a photon rocket; and a space ship propelled by the energy of interstellar matter. *Subject Headings:* **1. Relativity theory 2. Interplanetary travel.**—*Author's abstract.* Ⓢ

11.4–164 629.1.035

Sänger, Eugen (*Physics Experiment Institute, Stuttgart Airport*), **Strahlungsquellen für Photonenstrahlantriebe.** [Sources of radiation for photonic jet propulsion.] *Astronautica Acta*, Vienna, 5(1):15–25, **1959.** 3 figs., 4 refs. German, English and French summaries p. 15. **DWB**—The scope within which photonic jet propulsion can compete with the other systems of jet propulsion is seen to lie in interstellar space travel, and with traveling speeds exceeding perhaps one million km/h. Gas plasmas of a sufficiently high radiation pressure,

perhaps consisting of elements from the upper part of the periodic table of elements have bee considered as sources of radiation at temperatures around 150,000°K. Black radiation may b approximately expected from these plasmas, with optical layer thicknesses that are technicall conceivable. *Subject Headings:* **1. Photonic jet propulsion 2. Radiation sources for je propulsion.**—*Author's abstract.* Ⓢ

11.4–165 551.507.362:551.510.536:551.510.4

Wyckoff, P. H., **Rockets and radicals.** *Shell Aviation News*, London, Paris, No. 233–23 Nov. **1957. DWB**—The author comments on the subject of atomic oxygen and the use o free radicals for rocket propulsion. Using a "handbook" type of calculation, he arrives at th conclusion that a vehicle with an inlet scoop of 10 m² travelling at satellite velocity of 18,00 mph, would pass through sufficient atomic oxygen to develop 164 hp if all the energy could b converted to thrust. *Subject Headings:* **1. Rocket propulsion 2. Upper air chemistry 3. Free radical propulsion.**—*A. V.*

E. SOLID EARTH GEOPHYSICS

1. GEODESY AND GEOPHYSICS

See also: **Geodesy texts** (Heiskanen), 11.4–7; **Geophysics institutes** (Bossolasco), 11.4–27.

11.4–166 550.3:061.6(569.4)

Pekeris, C. L., **Geophysics, pure and applied.** *Geophysical Journal*, London, 1(3):257–262 Sept. **1958.** fig., 14 refs. **DWB, DLC**—Geophysics is defined as the science of the physica processes of the earth, extending from the center of the earth to the sun. Recent seismological studies indicate that over 3500 km at the center of the earth are liquid and 2900 km above solid The density of rocks near the surface is 2 g/cm³ and of the earth as a whole is 5.5 g/cm³ and at the center may be 9 times as heavy as surface rocks. Temperature at the center may be 10,000°C, pressure may be 3–4 million atmospheres and rock densities twice as high as at surface (14–18). The latter value fits recently computed data from the Kamchatka earthquake (Nov. 4, 1952), with assumption of a liquid core. The author remarks on the complete gravitational survey made of an 8000 km² area in Israel. Seismic profiles have also been made (1000 km) for oil prospecting. Ocean tidal analyses and atmospheric tides will be the subjects of research with the WEIZAC computer at the Weizmann Institute. *Subject Headings:* **1. Geophysical research in Israel 2. WEIZAC computer.**—*M. R.*

11.4–167 526:91.04(984)

Efimov, P. I., **Russkoe gradusnoe izmerenie na Shpitsbergene v 1899–1901 gg.** [Russian latitude and longitude measurements on Spitsbergen, 1899–1901.] Moscow, Izdatvo Geodezicheskoĭ Literatury, **1958.** 83 p. 7 figs., 17 tables, foot-refs.—The first chapter of this small monograph goes into the history of geodesy from the earliest times, into work in the Arctic by many countries through the past several centuries, and into more detail about Russian expeditions for measurement of latitude and longitude (with illustrations). Ch. II takes up triangulation work on Spitsbergen and gives some of the theory, examples of data and excerpts from the logs regarding weather conditions affecting the work in the 1899–1901 and more recent expeditions. Ch. III discusses astronomical and gravimetric work with sample of data and discussion and illustration of instruments. Ch. IV gives the scientific results of the work. *Subject Headings:* **1. Latitude and longitude expeditions, Spitsbergen 2. History of geodesy 3. Russian Geodesy expeditions 4. Triangulation 5. Spitsbergen.**—*M. R.*

2. SEISMOLOGY

11.4–168 550.340:534.647

Benioff, Hugo and Press, Frank (*both, Seismological Lab. Calif. Inst. Tech., Pasadena*), **Progress report on long period seismographs.** *Geophysical Journal*, London, 1(3):208–215,

Sept. 1958. 12 figs., 4 refs. **DWB, DLC**—Long period seismograph systems in operation in Pasadena are described. Extension of the group velocity curves for mantle Rayleigh waves and G-waves, the detection of these waves from earthquakes in the magnitude range $5\frac{3}{4}$–7, and the recording of unusual body waves with unsuspected long period components are among the results which have been achieved. *Subject Heading:* **1. Seismographs.**—*Authors' abstract.*

11.4–169 550.342

Hardtwig, E. (*Munich*), **Über die Entstehung der Mikroseismik.** [Origin of microseisms.] *Zeitschrift für Geophysik*, Würzburg, 23(2):83–112, **1957.** 2 figs., tables, 18 refs., eqs. **DLC** (QC801.Z4)—A new theory of microseisms, based on the assumption that the earth's crust is an elastic medium lying on a soft substratum and therefore acts as a free vibrating plate. The theory of modes of vibrations of free vibrating plates is developed; the dispersion curves as applied to the earth's crust (assumed to be a uniform granitic layer 30, 33 and 34 km thick) are constructed and presented; and the final conclusion reached after calculations of periods of maximum abundance of $T=4.3$, $T=12.6$ and $T=6.6$ sec and using Munk's formula that microseisms are free vibrations of the earth's crust which is assumed as a granitic layer 33 km thick, with only one chief mode of vibration. Observations are extended to a two-layered crust (granite and basalt). The theory would apply equally well to the surface or to the storm center hypothesis of origin of microseisms. *Subject Headings:* **1. Microseisms theory 2. Microseism origin.**—*M.R.*

11.4–170 550.341(480)

Porkka, M. T. (*Finnish Hydrological Off., Helsinki*) and Vesanen, E. E. (*Seismological Station, Univ. of Helsinki*), **Earthquake in Ranua and Pudasjärvi 1956.** *Geophysica*, Helsinki, 5(4):226–229, **1958.** fig., 2 tables, 6 refs. **DWB, DLC**—Seismographs at the new seismograph station at Sodankylä, Finland, recorded an earthquake at 1.5°S. of the station on Dec. 24, 1956. The epicenter was at 65.7°N, 27.4°E, and the shock was of intensity III–IV. It was felt in an apartment at Rovaniemi, 110 km from the center. Three aftershocks of intensity II and III were felt. Such shocks occur 12–15 times in a century here. Data are tabulated and area shown on map of north Finland and Sweden. *Subject Headings:* **1. Earthquake, Sodankylä, Finland (Dec. 24, 1956) 2. Sodankylä, Finland.**—*M.R.*

11.4–171 550.342:551.551:551.515.1

Rocard, Yves (*Ecole Normale Supérieure, Paris*), **Petits mouvements de la terre dus aux fluctuations des vents.** [Small earth movements due to wind fluctuations.] *Annales de Géophysique*, Paris, 15(4):551–554, Oct./Dec. **1959.** fig., 18 eqs. **DLC**—Wind fluctuations, and particularly those linked to the arrival of a depression, cause small agitations which are recorded by sensitive seismographs. The author determines the effects caused by wind fluctuations by calculating soil deformation caused by pressure applied at a small distance from the seismograph. Static pressure variations exerted by the air on the soil are in reality variations due to wind speed fluctuations and they seem to cause weak microseisms. Calculation of the extinction of agitation with depth shows that deep burying of sensitive seismographs is useless. *Subject Heading:* **1. Microseisms from wind fluctuations.**—*A.V.*

11.4–172 550.342

Rykunov, L. N. and Prosvirnin, V. M., **Ob iskazhenii azimutov na istochnik microseĭsm, vyzyvaemom usloviiami ikh rasprostraeniia.** [Distortion of the azimuth for the source of microseisms due to their propagation conditions.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:1026–1028, **1958.** 2 figs., 12 refs., eqs. **DLC.** Transl. into English by I. A. Mamantov in the **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Ser.*, No. 8:589–591, Aug. 1958, issued **1959,** by the American Geophysical Union. **DWB**—This paper is concerned with estimating the magnitude and indicating a method for eliminating errors in determining the coordinates of the source of microseisms according to the method of triple stations when such errors arise as a result of possible refraction of the microseisms during their distribution of the ocean bottom. The graph of the relationship of phase velocity of

Rayleigh waves and ocean depth (for a granite and basalt bottom) was constructed with the aid of Biot's formula:

$$4\sqrt{1-\frac{c^2}{b^2}}-\frac{\left(2-\frac{c^2}{b^2}\right)^2}{\sqrt{1-\frac{c^2}{a^2}}}=\frac{1}{\rho}\left(\frac{c}{b}\right)^4 f(c),$$

$$f(c)=\frac{tg\left(cT\sqrt{-1+\frac{c^2}{a^2_0}}\right)}{\sqrt{-1+\frac{c^2}{a^2_0}}}, \qquad c>a_0,$$

$$f(c)=\frac{th\left(cT\sqrt{1-\frac{c^2}{a^2_0}}\right)}{\sqrt{1-\frac{c^2}{a^2_0}}}, \qquad c<a_0,$$

where c = phase velocity of a Rayleigh wave, a and b = velocities of longitudinal and transverse waves, a_0 = velocity of sound in water, ρ = density of material, T = period of a Rayleigh wave. Curves for basalt and granite almost coincide for depths greater than 3.5 km; at depths between 1.5 and 3.5 km there is a considerable change in phase velocity (from 2.9 to 1.8 km/sec). With the aid of the computed data and a map of the North Atlantic with isobaths, the characteristics of the trajectories of the propagation of microseisms are strong. *Subject Heading:* **1. Microseism source determination.**—*I.L.D.*

11.4–173 550.340

Seismic studies in the Andes, *American Geophysical Union, Transactions,* 39(3):580–582, June **1958.** fig. **DWB, DLC**—The seismic studies conducted in the Andes during the summer of 1957 reveal much. The "immediate aim of this expedition was to determine the character of the roots of the Andes by measuring the waves from explosions used in the open-pit copper mines of Peru and Chile." Results of the expedition are included. "Further observations of explosion waves toward the coast were to be made during IGY." *Subject Headings:* **1. Seismic soundings 2. Explosion waves 3. Andes.**

11.4–174 550.341:551.24

Shlanger, Ari (*Seismological Lab., Met. Inst., Uppsala*), **Free non-radial vibrations of the earth.** *Geofisica Pura e Applicata,* Milan, 43:23–35, May/Aug., **1959.** 4 tables, 9 refs., 37 eqs. English and German summaries p. 23. **DWB, DLC**—Earthquake shear waves with period around 12.2 min have been lately reported by M. BÅTH (1958), who suggests that these might be due to torsional vibrations of the whole mantle on some axis through the centre of the earth. An attempt has been made here to put forward a theory which accounts for such vibrations. The general elastokinetic equation for a heterogeneous isotropic medium is solved for a free spherical shell overlying a liquid core, and the solution is investigated for the first two modes. The frequency equation is solved for a shell and the limiting cases of a full sphere and an infinitely thin shell. Application is then made for various approximate mantle models, and periods are found which are in fair agreement with the observed. It is then shown that if the rigidity of the core is taken into consideration a closer agreement with the observed might be attained. *Subject Headings:* **1. Earthquake shear waves 2. Torsional vibration of earth's mantle.**—*Author's summary.*

F. OCEANOGRAPHY, HYDROLOGY AND GLACIOLOGY

1. OCEANOGRAPHY

See also: **Hist. of oceanog., Atlantic** (Outhwaite), 11.4–17; **Popular oceanog.** (Fisher), 11.4–22; **Radiocarbon and tritium distribution in oceans** (Craig), 11.4–81; **Effect of earth's rotation on tides** (Bonnefille), 11.4–229.

11.4–175 551.556.8:551.461.2

Ichiye, Takashi (*Woods Hole Oceanog. Inst. & Japan Met. Agency*), **The response of a stratified, bounded ocean to variable wind stresses.** *Oceanographical Magazine*, Tokyo, 10(1):19–63, June **1958.** 25 figs., 4 tables, 15 refs. numerous eqs. **DLC**—One of the most interesting and important problems in physical oceanography is to know how oceanic circulation responds to variable wind stresses. The author published a theory of time-dependent wind driven circulation in a bounded ocean about seven years ago (Ichiye, 1951), which was shown by Veronis and Morgan (1955) to be incorrect owing to the neglect of the divergence effect, and they gave a more complete theory including this effect. These works treated the problem in a homogeneous ocean. On the other hand, the density stratification is more or less important in the response problem, since in a stratified ocean internal mass adjustment may cause a different mode of motion from a homogeneous ocean. Recently two interesting papers of Charney (1955) and Veronis and Stommel (1956) have been published using this approach, treating a model of two-layered ocean without boundary, which are referred to as Ch and VS hereafter. The present paper is only a simple extension of these two works, including just a frictional force and west and east coast. The historical sketch of the problem and bibliography are given in VS. Here we treat a two-layered ocean in β-plane with an east and west coast in a straight line. As already pointed out in VS, the complete boundary condition, particularly at the west coast, should be nonlinear, since inertia terms are predominant near the west coast, owing to a rapid change of vorticity in zonal direction, so that the linearized vorticity equation is not valid there. However, such condition makes the mathematical treatment of the problem almost prohibitive. Therefore here we treat a simplified boundary condition of linear type and instead introduce a frictional force. Such a procedure might be permissible as the first step towards understanding a more realistic situation, as in the theory of stationary wind driven oceanic circulation the frictional boundary solution still provides a simple picture of the first approximation about oceanic circulation instead of a more reasonable inertia boundary theory. In fact, the introduction of the frictional force seems to be inevitable, so far as we assume that the linearized vorticity equation is valid even near the west coast, because if we neglect the friction in an ocean with east and west coast the boundary conditions at these two coasts give an extremely unstable solution as indicated in a private manuscript of Walter Munk (1957). In such a situation, only the introduction of friction makes the physical interpretation of the solution possible by rapidly decreasing the amplitude of such solution with distance from the coast. *Subject Headings:* **1. Wind stress on water 2. Wind driven currents.**—*Author's introduction.*

11.4–176 551.461.2:551.543(262.1)

Lacombe, Henri and Lizeray, Jean-Claude, **Sur une cause des variations du niveau moyen de la Méditerranée et du régime du détroit de Gibraltar.** [A cause of the fluctuations in the mean level of the Mediterranean Sea and in the regime of the Straits of Gibraltar.] *Académie des Sciences, Paris, Comptes Rendus*, 249(5):734–736, Aug. 3, **1959.** fig., ref. **DWB, DLC**—Study on the relationship from cause to effect between the variations of atmospheric pressure and mean level of the Mediterranean Sea. A diagram indicates the fluctuations of atmospheric pressure and the variations of the mean water level during August 1958 for different points of the Mediterranean Sea. The curves show a correlation between pressure and sea level, but this correlation varies and is not uniform for the whole of the Mediterranean Sea. Beyond the action zone of dynamic effects, water level and pressure present a direct correlation without including the action of wind. The dynamic effects are due to the fluctuation of the regime of the Straits, the fluctuations themselves depending on the distribution of atmospheric pressure over the western Mediterranean Sea. This distribution should thus be considered, at least for the period August 1958, as an important cause of the fluctuations in the regime of the

Straits of Gibraltar, and consequently of the variations of the water level in the basin. *Subject Headings:* **1. Sea level variations 2. Pressure variation effects on sea level 3. Mediterranean Sea 4. Straits of Gibraltar.**—*A.V.*

11.4–177 551.509.5:529.59:551.46:551.515.2(52)

Shiroma, K., **Investigation of the great sea-waves caused by typhoons 5609 and 5612.** *Journal of Meteorological Research*, Tokyo, 10(7):562–565, July **1958.** 5 figs., 2 refs., eq. In Japanese; English summary p. 562. **DLC.** Also reprinted in: *Oceanography and Meteorology*, Nagasaki, Japan, 9(184), **1959.**—The wave growth generated by the three typhoons 5609, 5612 and 5615, was examined and the possibility of wave forecasting was studied. The maximum wave height at Hashima, a gate island of Nagasaki Harbor, reached 13 m at the time of the typhoons 5609 and 5612, while only a few meters at the time of the typhoon 5615. BRETSCHNEIDER'S nomograms were used for the computation. For the determinations of the effective wind speed, fetch, duration, and distance of decay, NAKANO and UNOKI'S method was used. The method assumes that the wave at Nagasaki is represented by the eight component waves which are generated by the component wind speeds along the eight directions of the straight lines radiated from the origin at Nagasaki, the angles of which are successively 170° to 240° in the interval of 10°. *Subject Headings:* **1. Typhoon waves 2. Ocean waves forecasting 3. Nagasaki, Japan.**—*Author's abstract.*

11.4–178 532.66:551.465:525.6

Takano, Kenzo, **Effet de passage d'une houle linéaire plane sur un seuil.** [Crossing effect of a flat linear swell on a shelf.] *Académie des Sciences, Paris, Comptes Rendus*, 248(12): 1768–1771, March 23, **1959.** 3 refs., eqs. **DWB, DLC**—Study of the crossing effect of a flat nonrotational swell over a prismatic obstacle with rectangular section, completely immersed and resting on the horizontal bottom of the channel on one of its faces. This problem is a peculiar case of that of flat-linear tidal waves, at variable depth. *Subject Headings:* **1. Fluid mechanics 2. Tidal waves 3. Obstacle effects on swell.**—*A.V.*

11.4–179 551.515.2:551.556.8:551.465

Unoki, S. (*Oceanog. Lab., Met. Research Inst., Tokyo*), **On the speed, travel time and direction of ocean waves due to tropical cyclones.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 34(6):354–363, Dec. **1956.** 8 figs., table, 11 refs., eq. In Japanese; English summary p. 354. **DWB, DLC**—Using the data obtained by the visual observation of 5 typhoons (1949–54) at the ocean weather station "Tango" (29'N, 135'E), the author tried to make a more unified analysis of the ocean waves caused by typhoons and hurricanes than that presented previously by others (CLINE & TANNEHILL). It is found that the periods of high waves due to a typhoon (8–16 sec) are longer than that of waves due to extratropical cyclones and the group velocity (20–45 km/hr) lower than is generally assumed. The waves in the rear of the center were higher and more irregular than those in the front, and the magnitude of the deviation of swells from wind, mostly to the right, depends on the path of typhoon. Figs. 4–8 and 9, and particularly 5 (an example of ocean waves within 1008 mb level) show that those in the front were 4.5–7.0 m and those in the rear 7.0–12.0 m; conspicuously higher. *Subject Headings:* **1. Wave direction in typhoons 2. Typhoon wave statistics 3. Wind-wave relationships in typhoons.**—*K.C.*

11.4–180 525.63

Voit, S. S., **Rasprostranenie prilivnykh voln iz proliva v otkrytyĭ basseĭn.** [Spread of tidal waves from a strait into an open basin.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:486–496, April **1958.** 5 figs., 2 refs., 39 eqs. **DLC**—It is assumed that a plane horizontal layer of fluid h, bounded by a vertical plane $y=0$, rotates around a vertical axis with an angular ω. A channel of width $2a$, perpendicular to the plane $y=0$, falls into the basin. Tidal waves, for which the frequency σ and distribution of normal velocities on the plane $y=0$, $|x|1>a$, are given flow into the mouth of the channel. The elevation $\zeta(x,y)e^{i\sigma t}$ of a fluid in a rotating basis is satisfied by the equation

$$\frac{\partial^2\zeta}{\partial x^2}+\frac{\partial^2\zeta}{\partial y^2}+\frac{\sigma^2-4\omega^2}{gh}\zeta=0.$$

or the elevation $\zeta(x,y)$ the following equation is derived

$$\zeta(x,y) = h \int_{-\infty}^{\infty} f(k) \frac{\sigma\sqrt{x^2-k^2}+2ik\omega}{\sigma^2-ghk^2} \exp\left[-i(\sqrt{x^2-k^2}y-kx)\right]dk.$$

he solution of the integral is achieved by means of asymptotic analysis. The equations btained are applied to the distribution of normal velocities along the cross-section of the nannel when the normal velocities are homogeneous along the entire cross section, and when ney are distributed according to a parabolic law. Finally the solution for the problem is arried out for the case when $\sigma^2 < 4\omega^2$. *Subject Headings:* **1. Tidal wave spread into open basins . Tidal dynamics.**—*I.L.D.*

2. HYDROLOGY

See also: **Afforestation influences on water balance** (Leyton, Carlisle), 11.4–53; **Forest hydrology, Freiburg Canton** (Nägeli), 11.4–54; *also* **Sec. on Hydrometeorology,** p. 576.

11.4–181 551.579:519.2

Alexander, G. N. (*State Rivers and Water Supply Comm., Australia*), **Return period relationships.** *Journal of Geophysical Research,* Wash., D. C., 64(6):675–682, June **1959.** 5 tables, 4 refs., 9 eqs. **DWB, DLC**—The samples available in hydrology are often so small that it is esirable to take their size into account when estimating parameters. By using a simple lassical model the relationship between various estimates of return periods derived from ydrologic time series has been obtained. Results for the "annual" and "base stage" series re compared with values given previously for a "complete" series and also with empirical alues used by the U. S. Weather Bureau. Effects of departures from the model assumed, aused by seasonal variation in probability of occurrence, or by correlation in magnitude, are econciled with observed results. *Subject Heading:* **1. Hydrologic statistics 2. Probabilities.** —*Author's abstract.*

11.4–182 551.482(282.254)

Chikvaidze, G. D., **Ob opredelenii srednogo mnogoletnego stoka v basseĭne verkhnogo echeniia Kubani.** [Determination of the mean long period discharge in the basin of the upper reaches of the Kuban' River.] *Meteorologiia i Gidrologiia,* Leningrad, No. 8:42–43, Aug. **1958.** ig. **DWB, DLC**—The relationship between the mean long period module of flow in the basin f the upper Kuban' River and mean height of the basin was determined from data of seven oints in the upper reaches of the river having a range of 2700–2170 m and data from rivers lowing somewhat west of the upper reaches of the Kuban' but in analogous physical geographic onditions. The graph showing this relationship is presented. It illustrates the vertical onation of the mean long period flow both as a whole and for the northern slope of the western art of the Major Caucasus, especially in the basin of the upper Kuban' River. Two groups f curves are shown, namely those for river basins adjacent to the regions studied and those or the river basins in the region investigated. *Subject Headings:* **1. River flow 2. Kuban' River, European U.S.S.R.**—*I.L.D.*

11.4–183 551.509.5:551.578.461:551.579(797)

***Federal-State Cooperative Snow Surveys and Water Supply Forecasts for Washington s of Feb. 1, 1957.** Prepared by Robert T. Davis. Also: **as of March 1, 1957, April 1, 1957, May 1, 1957.** 4 pieces, about 10 p. each. numerous tables. **DWB** (M78.46 U58fv)—Water upply forecasts are given for each separate river basin in the Columbia Basin and Puget Sound area. Snow cover and precipitation data for many stations are summarized in the abular portion of each report, for the critical months up to the data of issuance of the monthly eport and forecast. Records and forecasts for current year and past years are compared. *Subject Headings:* **1. Hydrologic forecasts 2. Water supply forecasts 3. Snow survey data . Washington State. I. U. S. Soil Conservation Service II. Washington (State). Dept. of Conservation and Development III. Davis, Robert T.** (*ed.*).—*M.R.*

11.4–184 551.579.5:581.1

Koshi, Paul T., **Soil-moisture trends under varying densities of oak overstory.** *U. S. Forest Service. Southern Forest Experiment Station, Occasional Paper*, No. 167, **1959.** 11 p. 2 figs., 3 tables, 11 refs. **DWB** (M79.5.U582o)—Plant growth, including the growth of forests, is profoundly affected by intricate interactions between the soil, the soil moisture, and the plants themselves. Understanding of so complex a relationship can be acquired only a little at a time as studies can be conducted in various soil types and different cover conditions. Phases of these relationships were studied on one important soil type near College Station, Texas in oak stands that had been thinned to three levels of basal area in a forage-production study. Electrical-resistance units were used to measure soil-moisture content in three soil horizons from May 1953 to August 1954. Laboratory determinations of physical soil characteristics afforded a basis for interpreting soil-moisture trends and for possible application of the data to other situations. *Subject Headings:* **1. Soil moisture—tree growth relationships 2. Soil moisture measurement techniques.**—*Author's abstract.*

11.4–185 551.579:551.509.5(791

Krick, Irving P., **Streamflow forecasts are reliable.** Photostat of separated pages 71–77 from *Electrical World*, N. Y., March 30, **1959.** 4 figs., 3 tables. **DWB** (M79.6 K923st)—A comparison of streamflow forecasts (made in the autumn by KRICK) for the Upper Columbia Basin in Washington state in 1957, for spring 1958, and of those made on a month-to-month basis by the U. S. Weather Bureau. The author claims great accuracy for his forecasts (2% error) which are based on North American airmass types. The severe cold winter of 1936–37 is used as an illustration of type "A," whereas the late winter of 1957–58 was characterized by a prevalence of type "E" producing warm weather and heavy rainfall in the basin. In type "A" the polar anticyclone is over the Mackenzie Valley and northern British Columbia-Alberta. In type "B" it is farther east and south, allowing warm air flow from the Pacific to cover the Pacific northwest. *Subject Headings:* **1. Long range streamflow forecasts 2. Hydrologic forecasts 3. Columbia Basin, Pacific N.W.**—*M. R.*

11.4–186 631.67:551.577(569.4

Mayer, A. **L'utilisation de l'eau en Israël.** [Water utilization in Israel.] *La Houille Blanche*, Grenoble, 14(4):492–504, July **1959.** 10 figs. **DLC**—Under present conditions the amount of water that can be collected in Israel is inadequate for irrigating all the land that could be made available for agriculture. Every last drop has to be used for this purpose; thus there can be no question of developing hydroelectric power. The plan to use water from the Mediterranean diverted into the Dead Sea, is not economical, in spite of the fact that a 392 m head is available, because the amount of water that could be used would have to be the amount that could be evaporated from the Dead Sea. Otherwise the level of the Dead Sea would rise. The author examines the various ways of using the water and in particular discusses the irrigation of the Negev using the waters of the Yarkon and the Jordan. *Subject Headings:* **1. Precipitation utilization 2. Irrigation 3. Israel.**—*Author's abstract.*

11.4–187 551.579.4(777,778,782

U. S. Corps of Engineers, **Report on storms and floods of spring 1947 in Missouri, Iowa and adjoining states.** May **1955.** 75 p. 14 plates, tables. **DWB** (M79.4 U582re)—Flood runoff and storm studies for the record breaking floods in the Missouri and upper Mississippi Basins in the spring of 1947 are included in this report along with much basic data. The meteorology of the season is treated thoroughly in Ch. 5 (p. 54–75). Three major floods occurred in the Des Moines River Basin at intervals of about one week. Isohyetal and mean monthly isobaric and isothermal charts for June 1947, as well as flood photographs, etc. are included. *Subject Headings:* **1. Floods, Missouri Basin (June 1947) 2. Storm flood studies 3. Iowa 4. Missouri 5. Nebraska.**—*M. R.*

11.4–188 551.579:551.509.5(479.25

†*Valesian, V. P., **Issledovanie stoka gornykh rek Armianskoĭ SSR.** [Investigation of runoff in mountain rivers in Armenian SSR.] Moscow, Akademiia Nauk SSSR, **1955.** 179 p. 13 figs., 35 tables, 2 maps (fold), Bibliog. p. 136–139. **DLC** (GB1308.A7V3). Review by I. S. Sosedov in *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 1:169–172, Jan./Feb. **1958.**—

The Armenian S.S.R. is a very mountainous region with few large rivers but numerous medium size and small watercourses that are important economically, especially for power. Since hydrometric stations in such a region are not adequate for proper estimates of water resources and for forecasts of water supply or floods, the scientific study and methodology is extremely important. This book gives a systematic review of methods and data, mostly before 1946, regarding methodology, physical geographic factors affecting runoff, climatic and hydrologic conditions of Armenian S.S.R., total evaporation from basin, and snow cover, soil and vegetation, normal runoff, annual and seasonal fluctuations, low water or minimum runoff and, finally, flood or maximum runoff. Much data (1927–1948) and hydrographs are included in text and charts and scatter diagrams are appended. *Subject Headings:* **1. River discharge 2. Hydrologic forecasting 3. Armenian S.S.R.**—*M.R.*

3. GLACIOLOGY

See: **Glacial climates, Poland** (Galon), 11.4–292; **Glacial advances, Nisqually Glacier** (Hofmann), 11.4–293.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Soil freezing calculation** (Bayerle), 11.4–47; **Measurement of radioactive substances in atmos., Tokyo** (Kawano, Nakatani), 11.4–70; **Radioactivity measurement techniques** (Stout et al.), 11.4–73; **Radioactive tracer techniques** (Arnold), 11.4–74; **Radioactivity measurement techniques** (Weise), 11.4–76; **Weather radar application to fallout forecasting,** 11.4–84; **Auroral obs. program** (Barbier), 11.4–107; **Radar echoes from auroras** (Kavadas, Glass), 11.4–113; **IGY aurora program** (Kosibowa), 11.4–115; **Atmos. conductivity measurement** (Anderson, Serby), 11.4–303.

11.4–189 551.501.5:551.524

Casswell, S. A., **A device for relating descriptive terms to air temperatures.** *Meteorological Magazine,* London, 88(1040):43–45, Feb. **1959.** fig., ref. **DWB, DLC**—The descriptive popular equivalents of certain temperature ranges, such as used in newspapers, etc., are arranged on a simplified "slide-rule" which permits immediate description of the day's temperature in any season of the year. The slide rule illustrated is made from paper but thin plastic would be better. *Subject Heading:* **1. Temperature slide rules.**—*W.N.*

11.4–190 551.501.75:551.507.362.1:551.557

Jenkins, Kenneth R. and Webb, Willis L. (*both, White Sands Missile Range, N. M.*), **High-altitude wind measurements.** *Journal of Meteorology,* Boston, 16(5):511–515, Oct. **1959.** 6 figs., 5 refs. **DWB, DLC**—The performance of the Loki wind-sensing rocket system is discussed. Altitudes in excess of those obtainable by standard sounding-balloon techniques were sampled in a series of ten Phase I Loki rockets fired at White Sands Missile Range, N. Mex. Wind measurements obtained by chaff and parachute sensors are presented for high altitudes while the measurements for the lower altitudes were determined by the rawinsonde technique. It is concluded that the Loki wind-measuring system offers a significant advance in the development of an operational meteorological sounding rocket. *Subject Headings:* **1. Upper air wind measurement techniques 2. Loki wind-sensing rocket system 3. Rocket measurement of wind.**—*Authors' abstract.* ©

11.4–191 551.501.81:551.587

Borchardt, Heinrich, **Das Wetterradar als Hilfsmittel der aerologischen Synoptik.** [Weather radar as an aid in synoptic aerology.] *Germany. Deutscher Wetterdienst, Berichte,* 7(51):106–110, **1959.** 15 figs. German and English summaries p. 106. **DWB, DLC**—Weather radar is most frequently used in "mesometeorology" as an aid to short range precipitation forecasts. By sufficient display of equipment and alliance to a net of radar sets it is possible to infer from continuous observations the further development of weather and the tropospheric conditions on a larger scale. The movement of precipitation areas observed by radar reflects the motions in the 700 mb surface. The position and movement of fronts, troughs

and convergences can be determined exactly and therefore make possible corrections of the meteorological charts. Areas of great instability can be recognized by showers and thunder storms appearing here and their vertical development can be measured. The height of the zero-degree surface can be fixed. Abnormal propagation shows strong inversions and stability of the troposphere. Radar observations prove the incompleteness of the ground based weather service and radiosonde-measurements. *Subject Headings:* **1. Synoptic aerology 2. Radar analysis of upper air.**—*Author's abstract.*

11.4–192 551.501.81:551.577.1(541)

Koteswaram, P. and De, A. C. (*both, Met. Office, Dum Dum*), **Vertical development of precipitation echoes from cumulus clouds near Calcutta during the post-monsoon season.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(2):173–178, April **1959.** 3 figs., 11 refs. **DWB, DLC**—Vertical development of precipitation echoes from cumulus clouds near Calcutta during the postmonsoon season of 1956 was studied by using a Decca Type-41 3-cm radar installed at the Meteorological Office at Dum Dum Airport. It has been shown that the origins of the first precipitation echoes were below the freezing level in most cases. The rate of growth of the precipitation echoes was found to be comparable with that found in U. S. A condensation-coalescence mechanism has been suggested for the formation of rain from these clouds. *Subject Headings:* **1. Radar precipitation echoes 2. Radar echoes from cumulus clouds 3. Dum Dum Airport, India.**—*Authors' abstract.*

11.4–193 551.501.81:551.515.3(764)

Smith, Robert L. (*U. S. W. B., Wash., D. C.*), **RHI radar observation of a funnel cloud.** *American Meteorological Society, Bulletin*, 40(5):230–232, May **1959.** 3 figs., 4 refs. **DWB, DLC**—On 15 Oct. 1957, an RHI radar observation was made of a reported funnel cloud with the CPS-9 radar at Texas A. & M. College, College Station, Tex. The funnel was reported by the Weather Station at Bryan Air Force Base at the time the radar observation was made. The synoptic situation and radar observations are discussed. PPI scope pictures as well as RHI illustrations are presented. *Subject Headings:* **1. Radar observation of tornadoes 2. Radar tornado detection 3. Funnel clouds 4. College Station, Tex.**—*Author's abstract.*

11.4–194 551.501.9:519.2

Gleeson, Thomas A. (*Florida State Univ.*), **Observational probabilities and uncertainty relations for meteorology.** *Journal of Meteorology*, Boston, 16(2):149–154, April **1959.** 4 figs., 2 tables, 9 refs., 27 eqs. **DWB, DLC**—The probability that an atmospheric feature of a given size will be observed in a region with a network of stations randomly distributed relative to the feature is shown to be a function of the feature and region sizes and the number of stations. The function is developed to give the probability of observing the feature in a network of stations with varying observational capabilities and the probability of observing several features simultaneously. Applications to aircraft reconnaissance, network design, climatology, and prediction are discussed, and effects of a variation in network density are considered quantitatively. Difficulties in meteorological observation are compared with those in atomic physics. Meteorological uncertainty relations, analogous to HEISENBERG'S uncertainty relation for atomic particles, are obtained and examined. *Subject Headings:* **1. Network density 2. Probability of observation.**—*Author's abstract.*

OBSERVATIONAL DATA

See also: **Met. data, Angola** (Espírito Santo), 11.4–14; **IGY data** (Veldkamp), 11.4–26; **Italian participation in IGY** (Bossolasco), 11.4–27; **Airport met. data, Sudan** (Bhalotra), 11.4–34; **Climatic design data, U. S.** (Fluor Products Co.), 11.4–65; **IGY auroral program** (Barbier), 11.4–107; **Soviet participation in IGY** (Fesenkov), 11.4–140; **Satellite obs. of upper atmos.** (Nicolet), 11.4–150, **IGY satellite program,** 11.4–151.

11.4–195 551.506.1(99)

***Bulletins Climatologiques—District de Kerguélen.** [Climatological bulletins for Kerguelen District.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctiques Françaises*, Paris, No. 7:37–40, April/June **1959.** Almost entirely tables. **DLC**—Climatological data relating to temperature, hygrometry, pressure, wind, precipitations

unshine and nebulosity for the Kerguelen District and Adélie Land during Jan., Feb. and March 1959. *Subject Headings:* **1. Monthly climatic summaries 2. Kerguelen, Antarctica.**—*A. V.*

11.4–196 551.506.7:551.582.1(699.13)

Rodier, R. L., **Le bulletin climatologique de Port-aux-Français.** [Climatological bulletin of Port-aux-Francais.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctiques Françaises*, No. 6:44–49, Jan./March **1959.** 3 tables. **DLC**—Climatological data (temperature, humidity, pressure, wind, precipitations and sunshine) and comments relating to the months October, November and December 1958 at Port-aux-Français. *Subject Headings:* **1. Climatic data 2. Port-aux-Français, Antarctica.**—*A. V.*

11.4–197 551.506.7(41/2)

*Great Britain. Meteorological Office, **Upper air data for stations maintained by the Meteorological Office: summaries of radio-sonde observations of temperature and humidity and of radar wind measurements at standard pressure levels, 1951–1955, Pt. 3, Lerwick.** Its *M.O.* 628 (Pt. 3), **1959.** 45 p. 3 plates, almost entirely tables, 14 refs. **DWB** (M06.7 G786u)—Standard type of summary of upper air data for Lerwick, Scotland (lat. 60°08′N, long, 01°11′W) for 1951–55, including extensive tables of monthly temperatures at standard levels to 40 mb, frequencies of tropopause pressure, temperature and height, contingency tables of tropopause pressure and temperature, heights of standard pressure surfaces and standard deviations, frequency of relative humidity, frequency and resultants and standard vector deviations of wind at standard pressure levels, etc. (For period 1946–50, *see* 4.3–45, 4F–98, 5D–209, 6.4–33, 6.8–88, 8.6–131, 8.8–146, and 8.9–125, *MAB.*) *Subject Headings:* **1. Upper air data 2. Tropopause data 3. Lerwick, Scotland.**—*M. R.*

11.4–198 551.506.7:551.515.2(263)

Hebert, Paul J. and Jordan, C. L. (*both, Dept. of Met., Florida State Univ.*), **Mean soundings for the Gulf of Mexico area.** *U. S. Weather Bureau, National Hurricane Research Project Report*, No. 30, April, **1959.** 10 p. 3 figs., 4 tables, 6 refs. Also in *Monthly Weather Review*, Wash., D. C., 87(6):217–221, June **1959. DWB** (M15.2 U5845r)—Mean aerological data for the Gulf of Mexico area have been prepared from 10-year records for three stations. Mean monthly height, temperature, and relative humidity data are tabulated for constant pressure surface. More detailed information, including density, potential temperature, and specific humidity, is shown for the mean "hurricane season" sounding. The mean data are compared with those previously presented for the West Indies area and some of the interesting climatological features are discussed. *Subject Headings:* **1. Upper air climatology data 2. Hurricane weather 3. Synoptic climatology 4. Gulf of Mexico.**—*Authors' abstract.*

INSTRUMENT CARRIERS

See also: **Satellite cosmic ray obs.** (Dobrotin), 11.4–134; **Satellite cosmic ray recorders** (Vernov et al.), 11.4–139; *also* **Sec. D8,** p. 535; **Sodium clouds ejected from Veronica rockets** (Vassy, Vassy), 11.4–248.

11.4–199 551.507.321:551.508.25:551.521.18

Gates, David M. (*Natl. Bur. of Standards*), **Infra-red spectroscopy from balloons and the possibility of some observations on the biosphere.** *Institute of the Aeronautical Sciences, IAS Report*, 59-47, **1959.** 5 p. table. **DWB** (629.1308.I59re)—Discusses the use of infrared spectroscopy for determining atmospheric constituents as measured from a manned balloon and the use of the manned balloon vehicle for observations of the biological organisms existing in the biosphere. The first high altitude balloon flight for this type of investigation was initiated on 22 June 1955. At that flight telluric absorptions from the visible to 2.5 microns were observed. A maximum height of 100,000 ft was reached. Since then other flights were undertaken on 3 Aug. 1956, 9 Oct. 1957, 12 June, 1958 and the wave length visibility at ceiling altitudes of 65,000 ft, 96,600 ft and 96,000 ft were recorded visible to 4.5μ, 5.0μ and 5.0μ, respectively for the Denver area. Similar research has been undertaken by the Royal Aircraft Establishment in England and by the Canadian Armament Research and Development

Establishment. *Subject Headings:* **1. Infrared spectroscopy 2. High altitude balloon ascents 3. Balloon investigation of the biosphere.**—*N.N.*

11.4–200 551.507.321.2

*Angell, J. K. (*Office of Met. Research, U. S. W. B.*), **A summary of Navy-sponsored 300-mb constant level balloon (transosonde) flights from Japan in 1957–1958.** Wash., D. C., U. S. Weather Bureau, March **1959.** 53 p. Almost entirely charts. **DWB** (M07.321.2 U587su). Also: **A summary of Navy-sponsored 250-mb constant level balloon (transosonde) flights from Japan in 1958–1959.** *Ibid.*, June **1959.** 53 p. Almost entirely charts, ref. **DWB**—From Sept. 1957 through June 1958, the United States Navy flew constant level balloons (transosondes) from Iwakuni, Japan on an operational basis. These balloons, set to float at approximately 300 mb, were generally positioned at 2-hourly intervals by means of the Navy radio-direction-finding (RDF) network while the balloons were west of 135°W long. and by the Federal Communication Commission RDF network while the balloons were east of this long. Many of these transosonde fixes were plotted on National Weather Analysis Center (NWAC) 300 mb maps and served as useful aids to 300 mb analysis, particularly over the Pacific and Atlantic Oceans. The purpose of these manuscripts is to provide a ready reference to these 300 mb transosonde flights with the hope that meteorologists may thereby be encouraged to use these unique data for research purposes. The second series of reports gave trajectories of individual transosonde flights from Iwakuni, Japan, across the Pacific and in some cases across N. America and into the Atlantic Ocean at 300 mb (1957–58) and 250 mb (1958–59) and summarized results. The final report gives monthly composite charts of trajectories for Sept. 1958–April 1959, and detailed information at 6-hourly intervals during 87 selected flights during this period, plus monthly charts giving transosonde positions and derived winds as plotted on NWAC 250 mb charts during each month of this period. During Dec. 1958–Feb. 1959, 86% of all flights were followed for at least 1 day and average wind speed was 81 kn, with 4% of flights having winds >150 kn at 250 mb. *Subject Headings:* **1. Constant level balloon flights 2. Transosonde data 3. Transosonde trajectories 4. Transosonde derived winds 4. North Pacific 6. North America 7. Iwakuni, Japan.**—*Author's abstract and M.R.*

11.4–201 551.507.321.2:551.513.2

Van Mieghem, J., **Les ballons-sondes plafonnant à un niveau barique constant et les sondes transocéaniques.** [Constant level balloons and transosondes.] *Ciel et Terre*, Brussels, 75(3/4):77–90, March/April **1959.** 3 figs., 5 refs. **DLC**—Description of constant-pressure balloons and account of the principles and devices used in order to maintain them at a constant level. Description of transosondes and short account of the first ascents. Discussion of the validity of data supplied by transosondes shows that the upper air data deduced from their paths are representative of the synoptic motions of air. Author points out that the first results obtained by means of transosondes look hopeful. Paths of constant level balloons permit computation of the acceleration of air and improve the determination of the contours of the isobaric surface on which the balloon travels. On the other hand, over North Atlantic, paths of constant level balloons reveal not only errors in analysis, but also important peculiarities of the stream lines which could not be detected through analysis of upper air charts. *Subject Headings:* **1. Constant level balloons 2. Transosondes 3. Wind field over ocean.**—*A.V.*

INSTRUMENTS

See also: **Atmos. analysis instrumentation symposia,** 11.4–3; **Temp. instruments** (Peyer), 11.4–40; **Cloud chamber studies** (Baradzeĭ et al.), 11.4–132; **Infrared spectroscopy from balloons** (Gates), 11.4–199; **Turbulence structure measurement** (Cramer), 11.4–256.

11.4–202 551.508:621.315

Barthelt, H. P., **Fern-Registrierung von Temperatur und Feuchte auf einem Funkturm in Hoehbeck.** [Distance recording of temperature and humidity on a broadcasting tower in Hoehbeck.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):53–64, **1959.** 8 figs. German, English and French summaries p. 53. **DWB, DLC**—The radio tower of the Hoehbeck broadcasting station of the German postal service is 160 m high. On this tower 6 installations are mounted for the recording of relative humidity and air temperature. For

more than a year uninterrupted records by means of electronic devices have been obtained. The principle of the wiring diagram and the instrumentation are described. *Subject Headings:* **1. Distant recording equipment 2. Electronic recorders 3. Relative humidity 4. Air temperatures.**—*Author's abstract.*

11.4–203 551.508.21

*†Pastiels, Roger (*Inst. Royal Météorologique, Belgium*), **Contribution à l'étude du problème des méthodes actinométriques.** [Contribution to the study of the problem of actinometric methods.] *Belgium. Institut Royal Météorologique, Publication, Ser. A*, No. 11, **1959.** 128 p. 48 figs., 21 tables, 44 refs. **DLC**—This important study of the problem concerning actinometric measurement methods includes 4 chapters. In Ch. I the fundamental peculiarities of actinometers considered from a purely geometrical point of view are explained. By demonstrating a theorem strictly analogous to that of LAMBERT, the ratio surface—angle of an actinometer is geometrically linked up with the sizes of its diaphragm system and an easily computed and reliable formula is obtained for the ratio: surface-angle of an actinometer. Ch. II is devoted to the computation of circumsolar radiation contribution in the measurement of direct solar radiation in the case of a group of actinometers. The subject of Ch. III is the complete calculation of circumsolar sky contribution in the measurements made with the principal actinometers actually in use. It is, in fact, the application of information given in Ch. I and II that makes it possible to judge conditions peculiar to each actinometer. Ch. IV introduces a new factor to be considered in order to be sure of the exactness of actinometric measurements. It concerns the physical properties which ought to be clearly set apart from the peculiar effects linked with the geometrical properties of the diaphragm system. Experimental study has been made in a laboratory and results have been obtained for the various thermopiles used in the actinometers. After this analysis it is possible to draw conclusions concerning the optimum size of actinometers. The theoretical and experimental conditions of actinometric testing and pyrheliometric-scale calibration could also be determined. *Subject Headings:* **1. Actinometers 2. Radiation measurement techniques 3. Direct solar radiation measurement 4. Circumsolar sky radiation 5. Pyrheliometric scales.**—*A. V.*

11.4–204 551.508.21:551.55

Portman, Donald J. and Dias, Fleming, **Influence of wind and angle of incident radiation on the performance of a Beckman and Whitley total hemispherical radiometer.** Michigan. Univ. Engineering Research Institute, Contract Cwb-9350, Final (and only) Report, April **1959.** 38 p. 16 figs. (incl. photos), 10 tables, 3 refs., 14 eqs. **DWB** (M08.5 M624re)—A Beckman and Whitley Model H188-01 Total Hemispherical Radiometer was tested in a wind tunnel and in the natural wind to determine the influence of wind speed and direction (relative to radiometer) on the indicated radiation. It was found that for the radiometer sensing element initially warmer than the air the indicated radiation was always less than actual radiation in the presence of wind and that, in general, it decreased with increasing wind speed. Cross winds had the greatest influence. An expression for wind error in indicated radiation is derived making it possible to estimate radiometer error from wind and air temperature data. The same instrument was tested to determine the influence of angle of incidence on the indicated radiation. Especially large deviations from the cosine law were found for large angles of incidence. These are explained by the shading caused by radiometer structural members surrounding the sensing element. The results are presented in both tabular and graphical form and the equipment and procedures are described. *Subject Headings:* **1. Radiometers 2. Radiation error of radiometers 3. Wind effects on radiometer observations.**—*Authors' abstract.*

11.4–205 551.508.26

Swindells, James F., **Calibration of liquid-in-glass thermometers.** *U. S. National Bureau of Standards, Circular*, No. 600, Jan. 8, **1959.** 21 p. 6 figs., 12 tables, 7 refs. "Supersedes *Circular* 8." **DWB** (M08.26 U585caL)—This circular contains information of general interest to both manufacturers and users of liquid-in-glass thermometers, as well as those who wish to calibrate thermometers or submit them to the National Bureau of Standards for calibration. Important elements of thermometer design are discussed, and eligibility requirements for certificates or reports of tests are given. Factors affecting the use of common types of liquid-

in-glass thermometers are included together with tables of tolerances and reasonably attainab accuracies. The calculation of corrections for the temperature of the emergent stem is give in detail for various types of thermometers and conditions of use. The circular also describ the techniques and equipment used in the calibration procedures and provides instructions f applicants requesting thermometer calibration services. *Subject Heading:* **1. Thermomet calibration.**—*Author's abstract.*

11.4–206 551.508.4

Cena, Giuseppe, **Il nuovo barometro a mercurio, di stazione, del Servizio Meteorologic dell'Aeronautica.** [The new mercury barometer used at stations of the Servizio Meteorologic dell'Aeronautica.] *Rivista di Meteorologia Aeronautica*, Rome, 19(3):43–46, July/Sept. 1959 3 figs., eqs. Italian, French, English and German summaries p. 43. **DLC**—The structura details and requirements of a new mercury barometer, of the fixed cistern type, recentl adopted by the Weather Service of the I.A.F. are here set forth. Its practical value and us are also made clear. *Subject Heading:* **1. Mercurial barometers.**—*Author's abstract.*

11.4–207 551.508.59:551.551:551.510.41

McCormick, Robert A. (*U. S. W. B. Research Station, Robert A. Taft Sanitary Engineerin Center, Cincinnati*), **Wind and turbulence instrumentation for air pollution studies.** (Wash D. C., U. S. Weather Bureau, March 16, 1959.) 20 p. Mimeo. **DWB** (M08.5 U587wi)— The pressing problem in turbulence instrumentation is not for new wind sensors but for con venient automatic and cheap methods of analysis and reduction of data now being obtaine in vast quantities. More demand for commercial bivanes would be created if good variability analyses were available. Equipment for vertical sampling and determination of air trajectories without towers is needed. Needs for "climatological" and for "synoptic" surveys in air pollution studies are discussed, and the "Black Box" referred to many times. *Subject Headings:* **1. Turbulence instrumentation 2. Wind data reduction equipment 3. Atmospheric pollution studies.**—*M. R.*

11.4–208 551.508.765:551.575:551.576

Godard, L., **Procédé pour déterminer les dimensions des gouttelettes de brouillard ou de nuages.** [Procedure for determining the dimensions of fog or cloud droplets.] *Puy de Dôme. Observatoire, Bulletin*, No. 1:11–13, Jan./March **1959.** 2 figs., 2 refs. **DWB**— Account of a simple, very sensitive and technically easy method for determining the sizes of water droplets in fog and clouds. A mixture of a solution of 5% gelatine with a solution of 5% collargol is spread on a clean glass plate. The impacts of the droplets present small disks, dark brown on the edges and surrounded by pale yellow rings. The diameter d of the droplet is connected to the exterior diameter D of the ring by the relation $d=kD$, where k is a factor varying according to the gelatine used. *Subject Headings:* **1. Fog drop size measurement techniques 2. Drop size distribution measurement 3. Cloud droplet size measurement techniques.**—*A. V.*

11.4–209 551.508.77

Itagaki, K. (*Hokkaido Univ., Sapparo, Japan*), **An improved radio snow gage for practical use.** *Journal of Geophysical Research*, Wash., D. C., 64(3):375–383, March **1959.** 8 figs., 6 refs., 7 eqs. **DLC**—A new type of radio snow gage has been developed. Its main features are: (1) A Geiger-Muller counter is buried under the snow layer so that the effect of temperature on the counter can be neglected. (2) The information obtained by this snow gage is sent by Morse code. (3) The relation between the water equivalent of snow and the number of Morse code is made to be linear. (4) The information of temperature and humidity are sent at the same time. The mechanism and the results obtained by this snow gage are described. *Subject Heading:* **1. Radio snow gages.**—*Author's abstract.*

11.4–210 551.508.82

Nepomniashchiĭ, S. I., **Novyĭ samoletnyĭ meteorograf dlia vertikal'nogo zondirovaniia atmosfery.** [A new airplane meteorograph for vertical sounding of the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:51–54, Jan. **1959.** 3 figs. **DWB, DLC**—A detailed description with the aid of photographs and diagrams of an airplane meteorograph for measur

ng pressure, temperature, humidity and air flow velocity in the wind tube. The underlying principle of this instrument is the transformation of elastic deformation of sensitive elements into mechanical movements of an arrow which are recorded on a tape. Air pressure is recorded in a range of 110–250 mb; temperature in a range of 45 to −60°C; humidity in a range of 20 to 100%; and wind velocity from 50 to 300 km/hr. The precision of the measurements was 3 mb for pressure, ±0.5°C for temperature and ±7% for relative humidity. The structure, installation and mechanisms of the individual sensing elements, of the timer and of the recording unit are described. *Subject Heading:* **1. Airplane meteorographs.**—*I.L.D.*

11.4–211 551.508.822

Aronsson, M. and Raab, L., **An automatic radiosonde receiver for the variable radio-frequency system.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):109–113, **1959.** 3 figs., 2 refs. English, German and French summaries p. 109. **DWB, DLC**—A system is described by means of which signals from variable radio-frequency radiosondes are recorded automatically on a common facsimile recorder. Herewith, the old time-consuming manual recording system can be abandoned and radiosoundings formerly made by two operators can now suitably be made by one operator only. Both time and staff can be saved in this way. *Subject Heading:* **1. Radiosonde recorders.**—*Authors' abstract.*

11.4–212 551.508.91

*Pollak, L. W. and Metnieks, A. L. (*both, School of Cosmic Physics, Dublin Inst. for Adv. Studies*), **New calibration of photo-electric nucleus counters.** *Geofisica Pura e Applicata*, Milan, 43:285–301, May/Aug. **1959.** 10 tables, 11 refs. German and English summaries p. 285–286. **DWB, DLC**—A new calibration of the improved version of a photoelectric nucleus counter with a fog tube of 3.85 cm air column diameter and blotting paper lining and of a photoelectric counter Model 1957 with air column diameter of 2.5 cm and ceramic lining was carried out by adjusting the calibration curve of 1946 with reference to the considerably improved absolute (Aitken type) counter with stereophotomicrographic recording. The experimental arrangement for the calibration, the method of sampling, the nuclei used, the procedure of measuring, the evaluation of the measurements with the photoelectric and photographic counter are discussed and the effect of dampness of the graticule in the photographic counter and the influence of the ambient or initial temperature on the concentration measurements with both types of counters have been theoretically and experimentally investigated. On account of the considerable influence of the dampness of the graticule on the counting results we have used exclusively for this new calibration, measurements on a sufficiently damp graticule. The deduction of the new calibration tables consisting in the adjustment of 7 fundamental points of the old calibration curve, is described. The agreement of the adjusted values for the two photoelectric counters with different air column diameters and linings which refer to the same concentration, is very good; the maximum difference is less than 2%. Basic waves of concentrations for 22 extinctions are given which should suffice for the construction of the new calibration curves for photoelectric counters with air column diameter of 3.85 cm fitted with blotting paper lining and of 2.5 cm diameter with ceramic lining. The new calibration is valid for an ambient temperature of 20°C. *Subject Headings:* **1. Photoelectric nuclei counters 2. Instrument calibration.**—*Authors' abstract.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Extended weather forecasting** (Kats), 11.4–10; **Extended weather forecasting** (Khrabrov), 11.4–11; **Weather radar application to fallout forecasting,** 11.4–84; **Ocean wave forecasting** (Shiroma), 11.4–177; **Hydrologic forecasts,** 11.4–183; **Streamflow forecasts** (Krick), 11.4–185; **Hydrologic forecasting** (Valesian), 11.4–188; **Fog dispersal** (Lot), 11.4–220; **Forecasting equatorial weather types based on jet streams** (Nevière), 11.4–260; **Cloudiness-synoptic weather type relationships** (Carpenter), 11.4–270; **Water table variation forecasting** (Larrieu), 11.4–288.

11.4–213 551.509:061.3(545)

Veranneman, N. L., **The second session of the Commission for Synoptic Meteorology.** *World Meteorological Organization, WMO Bulletin*, 7(2):69–74, April **1958,** 3 photos. **DWB**—

Account of session at New Delhi, India, Jan. 21–Feb. 15, 1958, attended by delegates from more than 30 countries and under chairmanship of W. BLEEKER of Holland who was replaced at the end by elected Pres. PAUL KUTSCHENREUTER of U. S. Codes, telecommunications networks, technical registrations and other questions were discussed. *Subject Headings:* **1. WMO. Synoptic Meteorological Commission meetings 2. New Delhi, India.**—*M.R.*

11.4–214 551.509.1:358.4

Guy, George A. (*A. F. Cambridge Res. Center*), **An Air Force weather system.** *Weatherwise*, Boston, 11(2):46–50, April **1958.** 5 figs. **DWB, DLC**—The new and "souped-up" system for data handling, processing communications and presentation from semi-automatic weather stations (either at airports or in reconnaissance planes) is described and outlined by means of flow charts, schematic diagrams, etc. The present observing, display and teletype system, which cannot now keep up with the supply or demand for observational data, would be replaced by a high speed network on 3000 cycle telephone circuits having a transmission capability of 1000 words per minute, and all U. S. stations would be on a single network with automatic call for data and automatic filtering out of unnecessary data at each drop. The system (No. 433L) is for use by U. S. Air Force but could be used by other U. S. military and civilian weather services. *Subject Headings:* **1. High speed communication systems 2. U. S. Air Force weather communication system.**—*M.R.*

11.4–215 551.509.3:551.511:551.513.1(99:42)

†*Mansfield, A. W. and Glassey, S. D., **Notes on weather analysis in the Falkland Islands Dependencies, Antarctica.** *Falkland Islands Dependencies Survey, Scientific Reports*, No. 16, **1957.** 27 p. 12 figs., 6 tables, 29 refs.—The meteorological observations in the Falkland Islands and conditions under which they are made were described in detail by PEPPER in a handsome volume issued in 1954 (*see* 6.5–3, May 1955, *MAB*). This monograph goes on to describe systematically the methods of synoptic analysis used since Jan. 1950 in forecasting for local whaling; an analytical discussion of the general circulation (zonal westerlies, circumpolar trough, continental anticyclones from Antarctica); air masses (Antarctic, polar maritime and tropical maritime); transformation of these same air masses; frontogenesis; cyclogenesis and, finally, the weather of South Georgia (wind, temp., frontal effects, standing waves, modification by islands, etc.). Numerous statistical tables, graphs, wind roses, charts, cross-sections, frequency diagrams, recorder traces, etc. are included in an analysis which covers a large portion of the Southern Hemisphere. *Subject Headings:* **1. Synoptic analysis, Falkland Islands Regions 2. Antarctic air masses 3. Southern Hemisphere air masses 4. Falkland Islands Area 5. Antarctica.**—*M.R.*

11.4–216 551.509.615:551.575.1:551.591.1

Serpolay, R. (*Observatoire du Puy de Dôme*), **Expériences d'amélioration de la visibilité par temps de brouillard, Aéroport de Paris-Orly, hiver 1958/59.** [Experiments for the purpose of improving visibility in foggy weather at the Paris-Orly Airport, winter 1958/59.] *Puy de Dôme. Observatoire, Bulletin*, No. 2:43–63, April/June **1959.** 6 figs., 2 tables, 10 refs. English and French summaries, p. 43. **DWB**—Experiments to improve the visibility on the runways in foggy weather and in temperatures lower than 0°C were conducted at Paris-Orly Airport during the cold season 1958–1959. The method and the various means of investigation used in the experiments are described. The results concerning the increase of visibility obtained from various initial conditions are presented and their meaning with regard to the present operational working of the Airport is discussed. During the experiments liquid propane pulverizations were used for fog seeding. The results obtained show that propane does not dissipate fog but improves the visibility by modifying it. *Subject Headings:* **1. Fog dissipation 2. Fog seeding experiments 3. Airport visibility control 5. Paris-Orly Airport, France.**—*Author's abstract.*

11.4–217 551.509.616

Franco, Pedro R., **Experimentos de inseminación de nubes en la cuenca del Duero.** [Cloud seeding experiments in the Duero Valley.] *Italy. Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti*, pub.

ec. 1958. p. 122–123. Spanish and Italian summaries p. 123.—Report of the experiments cloud seeding by means of AgI and NaI in the Duero Valley (Spain), carried out by the panish Meteorological Service. *Subject Headings:* **1. Cloud seeding experiments 2. Duero alley, Spain.**—*Transl. of author's abstract.*

11.4–218 551.509.617 519.2

Genève, R., **Sur le contrôle statistique d'une opération de pluie artificielle.** [On statistical ontrol of a cloud seeding operation.] *Puy de Dôme. Observatoire, Bulletin*, No. 1:1–6, Jan./ larch **1959.** 2 figs. **DWB**—Statistical study on artificial rain making carried out by the ater Resources Development Corporation in the Savoy Alps (France) from Oct. 1, 1954 to ct. 1, 1958. From a few stations in the operational region, diagrams of regression are com- ared. This analysis made it clear that the precipitation upon the target is modified from the eginning of the operation. But the recent measurements after the end of seedings do not onfirm this success. The series of observations on the inside of the target are not "naturally" omogeneous and hence their use is discouraged, whatever the method be: regression or eviation from the normal. The author is of the opinion that by the organization of artificial ain making in an intermittent way the difficulties of heterogeneity in series could be overcome. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding evaluation 3. Savoy Alps, rance.**—*A. V. and author's abstract.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY AND COMPOSITION OF THE ATMOSPHERE

See also: **Heat conductivity in rarefied gases** (Chapman), 11.4–85; **Meteor atmos. density determination** (Kovalevsky), 11.4–103; **Liquid water content of atmos.** (Arakawa), 11.4–131; **Satellite obs. of upper atmos.** (Nicolet), 11.4–150; **Upper air chemistry** (Wyckoff), 11.4–165.

11.4–219 551.510.41:546.264(436.14)

Steinhauser, Ferdinand, **Der Kohlendioxyd-Gehalt der Luft in Wien und seine Abhängigkeit von verschiedenen Faktoren.** [Carbon dioxide content of the air in Vienna and its dependence on various factors.] *Germany. Deutscher Wetterdienst, Berichte*, 7(51):53–61, **1959.** 2 figs., 7 tables, 16 refs. German and English summaries p. 53. **DWB, DLC**—Daily observations of the carbon dioxide content made at the Zentralanstalt für Meteorologie und Geodynamik in Vienna are discussed, with respect to their dependence on various meteorological factors. Considerable irregular fluctuations of the CO_2 content in Vienna and over snow covered areas in the mountains were found by G. Stetter (Physical Inst., Univ. of Vienna). For their explanation it seemed necessary to introduce the hypothesis that, in addition to the gaseous CO_2 as determined by the measurement, there is also a certain amount of CO_2 attached to "nuclei." The quantity of this CO_2-"aerosol" is not included in the measurement. The binding forces between the CO_2 and the "nuclei" may be altered by irradiation of various wave lengths. This is of importance for measurements of the CO_2 content, and indicates a dependence on air masses and general weather situations. Some experiments on the quantitative determination of the CO_2-"nuclei" are discussed. *Subject Headings:* **1. Carbon dioxide in the atmosphere 2. Carbon dioxide nuclei 3. Vienna, Austria.**—*Author's abstract.*

ATMOSPHERIC POLLUTION

See also: **Air pollution health effects** (Prindle), 11.4–59; **Radioactive fallout** (Flórián), 11.4–66; **Atmos. pollution studies** (McCormick), 11.4–207.

11.4–220 551.510.42:551.594:551.509.615

Lot, Fernand, **Hautes tensions et poussières électrisées.** [High voltages and electrified dust.] *La Nature*, Paris, No. 3291:316–317, July **1959.** 4 figs. **DLC**—Short review of the research, laws and applications of dust particles in electric fields. Among the applications, author mentions ultra-filters for industrial dust, high voltage generator with electrified particles

and the experiments concerned with fog dispersal at positive temperatures. Ionized dust i ejected at a speed of 50 m/sec. and rises to about 50 m; at this level it creates an electric fiel capable of gradually sweeping the fog droplets away. Tests were made at the Paris-Orl airport where a 10 m high funnel, equipped with an ionizer, can catch and send into the at mosphere a strong air current containing dust from a stream generating station. The field obtained spreads over a great number of hectares, and can reach 30,000 V/m at surface level *Subject Headings:* **1. Dust in electric fields 2. Fog dissipation 3. Paris-Orly Airport, France** —*A.V.*

11.4–221 551.510.42:546.74

Yagoda, Herman, **Observations on nickel-bearing cosmic dust collected in the strato sphere.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes*, No. 9, March **1959.** 5 figs. (2 photo plates), table, 3 refs. **DWB**—Stratospheric dust particles collected or plastic surfaces have been examined microchemically for the presence of nickel using di methylglyoxime as a specific developing reagent. Samples collected from four balloon flights with plateau elevations between 77,000 and 112,000 ft indicate the deposition of 0.17 to 0.3 nickel bearing particles per cm^2 per day of exposure. Most of the color reactions for nickel vary between 20 and 40 microns diameter, but some dust particles as small as 1 or 2 microns have given positive reactions. Experimental details of the technique are described. *Subject Headings:* **1. Nickel content of dust particles.**—*Author's abstract.*

UPPER ATMOSPHERE—IONOSPHERE

See also: **Radioactivity in the stratosphere** (Jehanno, Labeyrie), 11.4–69; **Ionos. magnetic storms** (Liakhova), 11.4–105; **Auroral effects on ionosphere** (Lukina), 11.4–117; **Upper air chemistry** (Wyckoff), 11.4–165; bibliog. on **Ionospheric physics**, p. 584.

11.4–222 551.510.5:551.513.1 551.506.7:551.507.362

Kallmann, H. Korf (*Rand Corp., Calif.*), **A preliminary model atmosphere based on rocket and satellite data.** *Journal of Geophysical Research*, Wash., D. C., 64(6):615–623, June **1959.** 5 figs., 3 tables, 3 refs., 7 eqs. **DWB, DLC**—The scientific results obtained from rocket and satellite observations have been studied in order to determine the physical properties of the atmosphere at high altitudes. A preliminary model atmosphere is presented for the region between 100 and 800 km. The paper contains numerical tables of density, pressure, and scale height as functions of altitude. Due to solar effects these physical parameters may vary from day to night and from latitude to latitude. However, preliminary studies have indicated that average densities and pressures might vary by at most a factor of two, the variations being larger at high than at medium latitudes. Densities presented by Russian scientists, which were also obtained from rocket and satellite data, agree with the model density presented here reasonably well. The densities derived by American and Russian scientists from satellite observations agree within less than a factor of two. The densities derived from rocket data are lower than the ones derived from satellite data for the same altitude. The maximum difference between the densities derived by MICHNEVICH (1958) from rocket data and the average densities presented here occur around 150 km, where the values differ by a factor of 3.8; above and below these altitudes the differences are much less. It is estimated that these differences then are within the limits of the variations to be expected and also within the limits of the uncertainties of the experimental data available at present. *Subject Headings:* **1. Atmospheric models 2. Rocket exploration of the upper atmosphere 3. Satellite observational data.**—*Author's abstract.* Ⓢ

11.4–223 551.510.52/3:551.524.7:551.557

†Chiu, Wan-cheng, **The wind and temperature spectra of the upper troposphere and lower stratosphere over North America.** *Journal of Meteorology*, Boston, 17(1):64–77, Feb. **1960.** 19 figs., table, 16 refs. **DWB, DLC.** Also issued as: New York. Univ. College of Engineering. Research Div. Contract AF 19(604)-1755, Scientific Report No. 4, Feb. **1959.** 53 p. 29 figs., table, 20 refs., 5 eqs.—The wind and temperature spectra of the upper troposphere and lower stratosphere over selected North American stations are constructed, by means of Tukey's

thod, from rawinsonde and radiosonde data taken by these stations. The variations of the ctral intensity with frequency (or period) and with height is fully discussed. The con- sions drawn from this study are given at the end of the paper. *Subject Headings:* **1. Upper posphere temperatures 2. Upper troposphere winds 3. Lower stratosphere temperatures Lower stratosphere winds 5. North America.**—*Author's abstract.*

11.4–224 551.510.034:551.521.31

Dütsch, Hans Ulrich (*Lichtklimatisches Obs., Arosa*), **Vertical ozone distribution from nkehr observations.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* enna, 11(2):240–251, **1959.** 4 figs., 2 tables, 9 refs. Also: **Vertikale Ozonverteilung aus nkehrmessungen.** [Vertical ozone distribution from Umkehr measurements.] *Schweizer- he Naturforschende Gesellschaft, Geneva, Verhandlungen,* 138:111–113, **1958.** fig. **DLC**)67.S4), **DWB**—Vertical ozone distributions have been computed from Umkehr observations - more than 30 cases on a digital electronic computer using first and second order terms of a ies expansion in the ozone content of nine atmospheric layers. The method has been ecked by recomputing some Umkehr curves from the calculated vertical distribution. The fluence of correcting terms for higher order scattering proposed by RAMANATHAN on the sults obtained by this method is discussed. Attention must further be given to errors in the mputed vertical distribution which can arise from ozone changes within the time of observa- on. While variations with season of the ozone content at heights above 25 km are relatively nall and in good agreement with the photochemical theory, the differences between spring id fall are very large below 20 km. They are without any doubt produced by air currents .e., general circulation). The second article is a short summary of the first. *Subject Head- gs:* **1. Vertical ozone distribution 2. Umkehr effects 3. Electronic computer analysis of :one distribution.**—*Author's abstract.*

RADIO METEOROLOGY

See: **Refractive index variations** (Bean, Riggs), 11.4–241.

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

11.4–225 551.511:551.513.2:551.557.5

Kleinschmidt, E., **Nicht-adiabatische Abkühlungen im Bereich des Jetstream.** [Non- diabatic cooling in the region of the jet stream.] *Beiträge zur Physik der Atmosphäre,* Frank- rt a.M., 32(1/2):94–108, **1959.** 9 figs., 8 refs., eqs. German, English and French summaries 94. **DWB, DLC**—Five cases of sudden trough formation in the jet stream have been udied. In most of these cases a closed high level cyclone was formed by a cut-off process. is found that the origin of the trough is connected with nonadiabatic cooling in a limited gion in the middle and upper troposphere. This cooling is so pronounced that it can not be plained by the presently known theories. It causes the formation of a new tropopause, ne lower limit of the so-called tropopause funnel in the cut-off cyclone. No attempt is made explain the cooling. *Subject Headings:* **1. Nonadiabatic cooling 2. Tropopause formation Jet stream dynamics.**—*Author's abstract.*

11.4–226 551.511.6:551.515:519.24

La Valle, Lodovico, **Analisi statistica dei termini delle equazioni della divergenza e della rticita.** [Statistical analysis of the terms of the divergence and the vorticity equations.] *ivista di Meteorologia Aeronautica,* Rome, 19(3):15–26, July/Sept. **1959.** 2 figs., 2 tables, refs., eqs. Italian, French, English and German summaries p. 15. **DLC**—In the study of sturbances on a synoptic scale, the following deductions can be drawn from a statistical nalysis of the terms of equations of divergence and vorticity: 1) the effect of changing latitude negligible; 2) neglecting the effect of inertia (i. e., the effects depending on the initial dis- ibution of velocity) can give a reasonable approximation, but especially as regards divergence, rough one. *Subject Headings:* **1. Divergence analysis 2. Vorticity equations 3. Statistica nalysis of atmospheric disturbances.**—*Author's abstract.*

11.4–227 551.511.13:551.55

Tippelskirch, H. v., **Weitere Konvektionsversuche: der Nachweis der Ringzellen un ihrer Verallgemeinerung.** [Further convection research: identification of annular cells an their generation.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):2–22, 195 6 figs., table, 12 refs., 5 eqs. German, English and French summaries p. 2–4. **DWB, DLC** The following investigation was carried out for the Flugmeteorologisches Institut of th Deutschen Forschungsanstalt für Segelflug in Munich-Riem which is under the direction H. Koschmieder. It is concerned with the experimental demonstration of a convection motion, hitherto not investigated, about which Zierep (*see* 10.2–254, Feb. 1959, *MAB*) firs reported on the basis of a special solution of the Rayleigh-Jeffreys theory. The particul feature of this motion is its appearance when local instability acts together with instabilit extended over an area in a fluid layer covering the plane. Zierep considered a fluid lay with critical vertical temperature gradient. In this layer he obtained a system of concentr annular (toroid) cells around the point of instability which was situated at the lower boundar The flow in the cells is in the same direction at the common boundary surfaces, and the velocit decreases with increasing distance from the point of instability. The diameter of the cel can be found by an eigen value problem. The purpose of this investigation was to demonstra this flow experimentally. Further, observations have been made which are no longer based o Zierep's theory, but which concern uniquely the same flow problem. These observatio show that the annular cells represent a special case of a convection current system for whic the notation "toroid cells" introduced by Zierep will be used generally. In particular could be shown: 1) The geometric form of the toroid cells is determined by the form of th local instability area, that is by the geometric configuration of the heat source activating th instability. 2) The flow in the toroid cells has the properties assumed by Zierep. 3) Wit less than critical stratification according to Rayleigh the horizontal temperature gradien determines the onset of the toroid flow. The magnitude of the vertical temperature gradien determines the number of cells and the speed of their formation. Above the critical vertica temperature gradient according to Rayleigh the flow is not persistent, but changes into th Bénard flow as far as the experiments show. Also below this gradient the flow cannot persis when the horizontal temperature gradient is below a certain not yet determined value whic depends on the magnitude of the vertical gradient. *Subject Headings:* **1. Convection cell 2. Convective motion 3. Toroid cells.**—*Author's abstract.*

11.4–228 551.511.13:551.558.

Zierep, Jürgen, **Über die Bevorzugung der Sechseckzellen bei Konverktionsströmunge über einer gleichmässig erwarmten Grundfläche.** [Preferred occurrence of hexagonal cell in convection currents over a uniformly heated surface.] *Beiträge zur Physik der Atmosphäre* Frankfurt a.M., 31(1/2):31–39, **1958.** 3 figs., 6 refs., 2 eqs. German, English and Frenc summaries, p. 31. **DWB, DLC** —Ever since Bénard discovered convection cells, experiments have shown that a hexagonal structure is preferred in these currents. In this attempt to provide a theoretical explanation of this phenomenon, the author considers regular polygons which provide a complete coverage of a plane (except parallelograms) and shows that hexagons are essentially manifested. This preference is regarded as a stability manifestation. Beginning with stationary solutions for various cell patterns, the author disturbs them slightly so that they are unstationary. When effects of similar disturbances are considered it is shown that the cell form is insensitive, i.e., stable in case of hexagonal cell forms while in the case of squares and (simultaneous) triangles there is no stability; in other indifference manifests itself. The existence of stability is shown for the case of two free surfaces at $z=0$ and $z=h$; but it is probable that this stability manifestation is independent of marginal conditions of $z=0$ and $z=h$. *Subject Headings:* **1. Convection cells 2. Bénard cells 3. Hexagonal structure stability.** — *I.L.D.*

11.4-229 551.511.3:551.465

Bonnefille, R., **La participation du Laboratoire National d'Hydraulique à l'étude de l'influence de la rotation terrestre sur la représentation d'un phénomène de marée sur modèle réduit hydraulique.** [The part played by the National Hydraulic Laboratory in investigating the effect of the earth's rotation on tidal phenomena by means of scale models.] *La Houille*

Blanche, Grenoble, 14(5):560-567, Aug. 1959. 7 figs. **DLC**—This article summarizes research carried out at the National Hydraulic Laboratory to determine the exact effect of the earth's rotation on the tide in the Gulf of St.-Malo in order to find out whether or not it is possible to build a nonrotating scale model to study the hydraulic phenomena associated with the construction and operation of the Chausey Isles tidal power station. The results given in this article refer to the nonrotating model of the English Channel, the diagrammatic rotating model of the English Channel and the investigation of tidal effects in a rotating triangular tank which is somewhat analogous to the gulf of St.-Malo. *Subject Headings:* **1. Sea currents 2. Tides 3. Rotation of earth-tide relationships 4. Gulf of Saint-Malo.**—*Author's abstract.*

11.4–230 551.511.3:551.552:551.542

Kao, S.-K. and Neiburger, M. (*both, Dept. Metr. Univ. Calif., Los Angeles*), **Oscillations and trajectories of air particles in some pressure systems.** *Journal of Geophysical Research*, 64(9):1283–1291, Sept. 1959. 9 figs., 14 refs., 28 eqs. **DLC**—With the assumption of isobaric or isentropic flow, particle trajectories in some fundamental types of pressure fields are investigated for an inviscid fluid in a rotating system with a constant Coriolis parameter. In a pressure system of which the characteristic (isobaric or isentropic) surface has a constant slope, particle trajectories may take the form of waves, cycloids, or loops, depending respectively on whether the magnitude of the geostrophic velocity is greater than, equal to, or smaller than that of the initial velocity of geostrophic deviation. Particle trajectories, for which the characteristic surface has wave shaped contours, show a combination of inertial and pressure waves when the relative frequency $k(U-C)$ is not equal to the Coriolis parameter. When the relative frequency is equal to the Coriolis parameter, a resonance phenomenon occurs; the amplitude of the trajectories increases linearly with time. For circular pressure systems the amplitude of the trajectories may be a sinusoidal, a linear, or an exponential function of time, depending respectively on whether the forcing parameter α is greater than, equal to, or smaller than—$\frac{1}{4}$. A pressure field with convergence or divergence of contours is shown to give an exponentially decreasing effect on the amplitude of the particle trajectories. *Subject Headings:* **1. Stream flow analysis 2. Atmospheric circulation theories 3. Air parcel trajectories.**—*Authors' abstract.*

11.4–231 551.511.32:551.558.1

Deguillaume, Marc, **La divergence et la diffluence en liaison avec les mouvements atmosphériques verticaux.** [Divergence and diffluence in connection with the vertical atmospheric motions.] *L'Astronomie*, Paris, 73(5):233–237, May 1959. 3 figs. **DLC**—This article includes very accurate definitions of the terms divergence and diffluence. The simplifying hypotheses commonly adopted in the problems concerning winds are generally no longer valid for questions regarding air displacements as weak as an upward or a downward current. Nevertheless, the author shows that in some very limited cases, when considering the diffluence of atmospheric currents, it is possible to determine if air possesses either upward or downward motion. He investigates the permanent diffluent regime, the permanent confluent regime and the permanent indeterminable regime. For each of these regimes, cases where speed increases, decreases or remains constant in the direction of the air displacement are examined. *Subject Headings:* **1. Divergence and diffluence 2. Vertical motion.**—*A. V.*

11.4–232 551.511.33:551.521

Giovanelli, R. G. (*Univ. Grounds, Chippendale, N.S.W.*), **Radiative transfer in nonuniform media.** *Australian Journal of Physics*, Melbourne, 12(2):164–170, June 1959. 10 eqs. **DLC**—The equation of radiative transfer incorporating Eddington's approximation is expressed in a form applicable to an inhomogeneous medium, as

$$\frac{1}{3}\nabla^2 J = \frac{1}{3x} + \nabla J \nabla . x + x^2(\lambda J - 4\pi S).$$

Here J is the total intensity, x the attenuation coefficient, λ the ratio of absorption and attenuation coefficients, and S the source function. A study is made of the emission from a simple

model inhomogeneous semi-infinite medium, including the relative effects of variations i x, λ, and S across the surface. Particular attention is drawn to the significance of variation in attenuation coefficient in connection with the appearance of chromospheric granulation *Subject Heading:* **1. Radiative transfer.**—*Author's abstract.*

11.4–233 551.511.6:551.551.8:535.3

Wippermann, F., **Zur Erdboden-Randbedingung bei atmosphärischen Diffusionsprozes sen.** [Boundary conditions for the earth's surface during atmospheric diffusion processes. *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):43–52, **1959.** 5 refs., 42 eq German, English and French summaries p. 43. **DWB, DLC**—In some atmospheric diffusio processes the particles arriving at a boundary surface such as the earth are partly absorbe partly reflected. In such cases an interaction factor β appears in the boundary condition for the earth's surface. The consideration of random flights against an elastic barrier permit a physical interpretation of this interaction factor. A relation can be established betwee this factor and the probability that a particle reaching the earth's surface will be reflected *Subject Headings:* **1. Atmospheric diffusion 2. Boundary layer theory.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Transosonde wind field determination** (Van Mieghem), 11.4–201; **Atmos. models** (Kallmann), 11.4–222; **Nonadiabatic cooling** (Kleinschmidt), 11.4–225.

11.4–234 551.513:539.155.2

Lal, D. (*Tata Inst. Fundamental Res., Bombay*), **Cosmic ray produced radioisotopes fo studying the general circulation in the atmosphere.** *Indian Journal of Meteorology and Geo physics*, Delhi, 10(2):147–154, April **1959.** 5 figs., 2 tables, 14 refs., 3 eqs. **DWB, DLC**—The possibility of using cosmic ray produced radioisotopes for studying large scale circulation in the atmosphere has been explored recently. The potential significance of these isotopes in the field of meteorology arises because of the following features in their production and properties. (1) Several radioisotopes are available whose half-lives are comparable to time scales involved in the atmospheric circulation. Four of the isotopes (S^{35}, Be^{7}, P^{33}, and P^{32}) have half-life periods ranging from three months to a fortnight, and one (Na^{22}) has a half-life of about two and a half years, and (2) Isotope production is continuous, constant, strongly dependent on the latitude and altitude in the atmosphere and independent of meteorological factors. These isotopes can be used for investigating the nature of circulation of air in the troposphere and the detailed mechanism of exchange of air between the stratosphere and the troposphere. Experimental work on the use of these isotopes in meteorology has so far been confined mainly to determination of the concentration in rain water by the Geophysics Research Group of the Tata Institute of Fundamental Research, Bombay. Some of the important results of these investigations are summarized in this paper. *Subject Headings:* **1. General circulation studies 2. Cosmic ray radioisotopes.**—*Author's abstracts.* Ⓢ

11.4–235 551.513(98/99)

†Lamb, H. H., **Differences in the meteorology of the northern and southern Polar regions.** *Meteorological Magazine*, London, 87(1,038):364–379, Dec. **1958.** 4 figs., 3 tables, 23 refs. **DWB, DLC**—Differences in the extent and arrangement of land, ocean and ice, and in the heat budget, introduce important differences of general atmospheric circulation as between Arctic and Antarctic. The southern upper westerlies are more powerful, more nearly circular in course and have less seasonal shift of latitude than their northern counterparts; in latitudes south of 40°S the main trough and ridge are apparently positioned by thermal controls. At the surface the most striking difference is the penetration of deep, vigorous depressions in many sectors south of 67°S in winter, so that little of Antarctica can be quite immune from the associated gales and blizzards. There should also be important differences between Northern and Southern Hemispheres in the response to small changes in the amount of incident radiation. *Subject Headings:* **1. General circulation in Arctic 2. Antarctic circulation 3. Polar climates 4. Arctic 5. Antarctica.**—*Author's summary.*

11.4–236 525.35:523.74:551.513

van den Dungen, F. H.; Cox, J. F. and Van Mieghem, J., **Sur les irrégularités de la rotation de la Terre.** [The erratic fluctuations in the rotation of the earth.] *Académie Royale de Belgique, Brussels. Classe des Sciences, Bulletin*, Ser. 5, 65(1):69–71, **1959. DLC**—Short survey of the recent work relating to the irregularities in rotation of the earth and remarks about the alleged influence of solar activity on the general circulation of the terrestrial atmosphere. The upper layers of the atmosphere are intensely affected by the irregular changes appearing in solar activity, but it seems that the downward propagation of the disturbances arising within the upper layers is accompanied with such a damping that they are no longer measurable in the lower layers. The balance of the kinetic moment of the atmosphere, the authors conclude, is under the influence of periodic fluctuations and nonperiodic fluctuations which correspond to fluctuations with contrary signs of the terrestrial globe's kinetic moment, and consequently fluctuations in the rotation speed of the earth. It is hoped that the aerological data of the IGY will make it possible to estimate the kinetic moment of the atmosphere with greater accuracy. This should lead to pointing out the seasonal and erratic fluctuations of this moment and to computing the corresponding fluctuations in the rotation speed of the earth. *Subject Headings:* **1. Rotation of the earth 2. Solar activity 3. Atmospheric circulation 4. Kinetic moment of the atmosphere.**—*A. V.* Ⓢ

11.4–237 551.513.2:551.557.2(497.2)

*Barov, V. and Angelov, A., **Vŭrkhu godishniia khod na zonalniia, meridionalniia i sredniia prenosi na vŭzdukha nad Sofiĭsko pole.** [Annual course of the zonal, meridional and average transfers of air over the Sofia plain.] *Khidrologiia i Meteorologiia*, Sofia, No. 1:42–55, **1959.** 3 fig., 10 tables, 7 refs., 4 eqs. Russian and English summaries p. 53–54. **DLC**—Winds at 500 m intervals up to 3500 m obtained from pilot balloon data for Sofia (Boiurishte) for 1925–1945 are analyzed as to the statistical parameters of monthly direction and velocity values of zonal, meridional and average transfer. *Subject Headings:* **1. Upper air wind trajectories 2. Meridional wind profiles 3. Zonal wind profiles 4. Sofia, Romania.**—*Based on authors' abstract.*

ATMOSPHERIC DISTURBANCES

See also: **Cyclone effects on thrombo-embolism** (Rückheim), 11.4–58; **Tropospheric disturbances** (Djakow), 11.4–87; **Microseisms from wind fluctuations** (Rocard), 11.4–171; **Typhoon waves** (Shiroma), 11.4–177; **Wave direction in typhoons** (Unoki), 11.4–179; **Radar obs. of tornadoes** (Smith), 11.4–193; **Thunderstorm formation** (Mügge), 11.4–266.

11.4–238 551.515.1:551.588.2(235.24)

Yang, Chien-chu; Wang, Kei-cheng and Lee, Yu-lan (*all, Inst. of Geophys. & Met., Academia Sinica*), **The influence of the Tibetan plateau upon the northern systems.** *Acta Meteorologica Sinica*, Peking, 30(1):99–113, Feb. **1959.** 8 figs., 13 tables, 9 refs. In Chinese; English summary p. 113. **DLC**—The daily 500 mb charts during the year June 1956–May 1957 are used to calculate the variations of intensity and moving speed of the upper troughs and ridges as they pass north of the Tibetan-plateau. It is verified that those variations are regular both in different seasons and in different areas. *Subject Headings:* **1. Orographic effects 2. Troughs and ridges 3. Upper level troughs 4. Tibetan plateau.**—*Authors' summary.*

11.4–239 551.515.23:551.578.7(492)

De Jong, J. J. G., **De verwoestende hagelbuien van 11 juli '59 in Drente en Groningen.** [Devastating hailstorms on July 11, 1959 in Drente and Groningen.] *Hemel en Dampkring*, The Hague, 57(10):225–234, Oct. **1959.** 7 figs. (including photos). **DWB, DLC**—A report is presented on the hailstorms and hurricane which caused great damage in orchards and greenhouses in Drente and Groningen (Netherlands) on July 11, 1959. The author describes the atmospheric situation on that day and outlines the tracks followed by the hailstorms and the hurricane; tracks of hailstorms and hurricane did not always correspond to each other. The showers originated in cumulonimbus clouds, which reached a height of from 12 to 14 km and developed very quickly. Several shower cells were formed, of which the largest was 75 km

long and about 8 km wide. The hailstones reached the size of a hen's egg, with diameter of 5 to 6 cm and a weight of 50 gr. The hailstone structure was rather different; six diagram are shown and described. Photos of egg-sized hailstones are presented. The wind spee during the showers was about 50 km/hr but attained to 150–200 km/hr in several places *Subject Headings:* **1. Hailstorms, Netherlands (July 11, 1959) 2. Hail damage 3. Netherlands** —*A. V.*

11.4–240 551.515.53:551.571.3(672)

Nevière, E., **Note sur la variation diurne du front intertropical en Afrique Equatoriale Française.** [Note on the diurnal variation of the intertropical front in French Equatoria Africa.] *France. Météorologie Nationale, Monographies*, No. 14:1–11, **1959.** 5 figs. **DWB**— The intertropical front in French Equatorial Africa is the trace at ground level of the dis continuity surface between Saharian dry air and equatorial humid air. The experiment base on the synoptic charts shows that the intertropical front is very often near the +12°C dew point isotherm. On the basis of diagrams of "dew point temperature in function of time," author shows that in French Equatorial Africa, the intertropical front is the object of wel marked and important diurnal oscillations which are displaced systematically towards the South in the morning, towards the North during the afternoon; 68% of the North-South oscillations occur between 03 and 12 G.M.T. and 30% of these between 06 and 09 G.M.T. conversely, 75% of the South-North oscillations occur between 12 and 21 G.M.T., and 41% of these between 15 and 18 G.M.T. *Subject Headings:* **1. Diurnal intertropical front variation 2. Dew point temperatures 3. French Equatorial Africa.**—*A. V.*

11.4–241 551.515.8:551.510.62

Bean, Bradford R. and Riggs, L. P., **Synoptic variation of the radio refractive index.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 63(1):91–97, July/Aug. **1959.** 18 figs., 12 refs., 4 eqs. **DLC, DWB**—The synoptic variation of the atmospheric radio refractive index, evaluated from standard weather observations, is examined during an outbreak of polar continental air. It is found that the reduced-to-sea-level value of the refractive index is a more sensitive synoptic parameter than the station value. The reduced value is quite sensitive to the humidity and density structure of the storm under study while the great station elevation dependence of the station value tends to mask synoptic changes. The reduced value changes systematically with the approach and passage of the polar front. The present system shows a consistent increase of the reduced value in the warm sector of the wave and a marked decrease behind the cold front. *Subject Headings:* **1. Refractive index variations 2. Synoptic radio meteorology.**—*Authors' abstract.*

RADIATION AND TEMPERATURE

RADIATION

See also: **CO_2 absorption by leaves** (Decker, Wien), 11.4–51; **Forest radiation, Ötztal Alps** (Turner), 11.4–52; **Albedo of planets** (Boggess, Dunkelman), 11.4–98; **Corpuscular radiation-aurora relationships** (Kolobkov), 11.4–114; **Night airglow** (Siedentopf), 11.4–124; *also* **Sec. D3**, p. 530; **Sec. D4**, p. 531; **Radiation belts** (Singer), 11.4–141; **Infrared spectroscopy** (Gates), 11.4–199; **Umkehr obs.** (Dütsch), 11.4–224; **Radiative transfer** (Giovanelli), 11.4–232.

11.4–242 551.506.1:551.521.1(675)

*Bonnet, G., **Etude de la radiation solaire à Lwiro en 1953.** [Study of the sun's radiation at Lwiro in 1953.] *Académie Royale des Sciences Coloniales. Classe des Sciences Naturelles et Médicales, Mémoires in* 8°, n. s., 6(6), **1958.** 78 p. 10 figs., 5 graphs, 5 photos, 18 tables, 19 refs. **DWB, DLC** (Q111.B78)—This work reveals the activity of the laboratory at Lwiro (Belgian Congo) since its establishment and gives some of the results obtained during 1952 and 1953. The methods of observation and analysis are related in detail in order to show the necessity of making the measurements with great care. The measurements and observations made at this center concern: solar radiation reaching the ground, sunshine duration, ultra-

iolet radiation reaching the ground, usual climatic measurements, measurement of cooling ate and cloud amount at night. The observational data relating to 1953 are shown in tables. hey indicate the mean values of rain and temperature for the different pentads of each month, he daily values of solar radiation and the sunshine duration for the different months of the ear. *Subject Headings:* **1. Solar radiation 2. Radiation measurement techniques 3. Observational data 4. Lwiro, Belgian Congo.**—*A. V.*

11.4–243 551.521.1:523.77:551.591.6:535.3

Dunkelman, L. and Scolnik, R. (*both, U. S. N. R. Lab.*), **Solar spectral irradiance and vertical atmospheric attenuation in the visible and ultraviolet.** *Optical Society of America, Journal,* 49(4):356–367, April **1959.** 9 figs., 3 tables, 30 refs., 4 eqs. **DWB, DLC**—The solar spectral irradiance outside the earth's atmosphere was determined by Langley's method of extrapolation to zero air mass, from measurements taken on Mount Lemmon at an elevation of 8025 ft near Tucson, Ariz., during October, 1951. The spectrum was produced and the energy scanned by a Zeiss quartz double-monochromator, detected by a 1P21 photomultiplier, amplified, and presented on a strip chart recorder. About 25 spectra were recorded from sunrise to noon, with band widths ranging from 10 Å at 3030 Å to 170 Å at 7000 Å. The equipment was calibrated frequently by recording the spectrum of a standard tungsten lamp. Compared with earlier work performed in this field, our results agree best with those of PETTIT. There is good agreement with the direct measurements from a rocket obtained by PURCELL and TOUSEY in 1954 and with the Sacramento Peak ultraviolet observations by STAIR and JOHNSTON in 1955. The change of solar intensity with air mass showed that the attenuation of the atmosphere above Mount Lemmon was approximately 15% higher than that for a Rayleigh atmosphere in the region 3400 Å to 4650 Å, where there is no absorption due to ozone. A discussion is included which emphasizes the importance of clear and constant atmospheres which are necessary to obtain accurate values of solar spectral irradiance outside the earth's atmosphere by the Langley method. The solar illuminance computed from spectral data was 12,700 lumens/ft². *Subject Headings:* **1. Solar spectrum 2. Atmospheric attenuation 3. Mt. Lemmon, Tucson, Ariz.**—*Authors' abstract.* Ⓢ

11.4–244 551.521.11:551.576.2(437)

*Kacvinský, M. and Priadka, O., **Slnečný svit a oblačnost v podunajskej nižine.** [Sunshine and cloudiness in the Lower Danube Plain.] *Geografický Časopis,* Bratislava, 11(4):262–276, **1959.** 15 tables, 3 refs. Russian and German summaries p. 275–276. **DLC**—Analysis of cloudiness and sunshine duration at Hurbanovo and other stations of the Low Danube Plain and comparison with observations made throughout Slovakia. The Danube Plain has abundant sunshine reaching a yearly value of 2000 hrs at places with free horizon. Hurbanova, used as the basis for a good statistical analysis, had a mean annual amount of 2016.6 hrs for the period 1901–1950; Bratislava, Presfany and Nitsa show higher values. The regions with lowest cloudiness are situated in the western and northern part of the Danube Plain; the cloudiness increases in the southern and eastern part. Sunshine and cloudiness show a great variability in these regions, due to the instability of the weather over Central Europe. The Lower Danube Plain is indicated for the cultivation of plants needing a high amount of sunshine. *Subject Headings:* **1. Climatic data, Lower Danube Plain 2. Sunshine duration, Lower Danube 3. Cloudiness, Lower Danube Plain 4. Lower Danube Plain, Slovakia.**—*A. V.*

11.4–245 551.521.16:635.41

Verkerk, K. et al., **The effect of daylength, gibberellin, seed vernalization and their interaction on spinach.** *Netherlands Journal of Agricultural Science,* Wageningen, 7(3):202–208, Aug. **1959.** 3 figs., table, 9 refs. **DA**—In the two spinach varieties "Breedblad Scherpzaad Zomer" and "Koning van Denemarken" the effects of daylength, gibberellin and seed vernalization on the growth in length of the stem were studied. Also the combined effect of these factors was investigated. For the rapid development of spinach the long day is of primary importance. The effect of each of the three factors separately is the strongest, combined with each other the effect of each is diminished. A possibility for vegetative propagation on a small scale is mentioned. *Subject Headings:* **1. Spinach cultivation 2. Daylength effect on spinach 3. Vernalization 4. Photoperiodism.**—*A. V.*

11.4–246 551.521.18 535-1

Deutschbein, O., **La rayonnement infrarouge et ses applications pratiques.** [Infrared rays and their practical applications.] *L'Onde Electrique*, Paris, 39(392):835–844, Nov. **1959.** 7 figs., 9 refs. **DLC**—After a brief historical review, the author enumerates the physical bases of infrared rays. The laws which determine their thermal emission from solids and gases are discussed as well as the problems of their transmission and detection. Civil and military applications are then discussed although these fields sometimes overlap. In the civilian field infrared technology is used for measuring and checking remote temperatures. Solar batteries use thermocouples and photo-voltaic cells as infrared detectors. Infrared rays are also used as barriers and for telecommunications for both military and civilian purposes. The major military applications are directed towards detecting and localizing objects by their heat radiation. Several recent developments in self-guided missiles with infrared searching heads are described. *Subject Headings:* **1. Infrared radiation 2. Infrared ray uses.**—*A. V.*

11.4–247 551.521.326:535.33

Connes, J. and Gush, H. P., **Spectroscopie du ciel nocturne dans l'infrarouge par transformation de Fourier.** [Night sky spectroscopy in the infrared through Fourier analysis.] *Journal de Physique et le Radium*, Paris, 20(11):915–917, Nov. **1959.** 3 figs., 14 refs. **DLC**—Study of the nocturnal sky spectrum by means of an improved Michelson interferometer at the Haute-Provence Observatory. The authors give a survey of the principle of the apparatus and a succinct account of the method used. This method comprises two stages: a) recording of the interferogram and b) elaborating its Fourier transform. The analysis of frequencies and intensities of the lines from the recorded interferograms shows that nearly all of them can be attributed to the radical OH (region 1.6 microns). The study of the spectra made it possible to compute the rotational temperature which is in the range of 270°K and agrees with other measurements made from lines about 8000 Å. *Subject Headings:* **1. Night sky spectroscopy 2. Infrared bands 3. Fourier analysis.**—*A. V.* Ⓢ

11.4–248 551.521.6 551.593.5:551.507.362.1 551.509.6

Vassy, Arlette and Vassy, Etienne, **Présence de la raie 3303 Å dans le spectre d'émission de nuages artificiels de sodium.** [The 3303 Å-line in the emission spectrum of artificial sodium clouds.] *Académie des Sciences, Paris, Comptes Rendus*, 248(15):2235–2236, April 13, **1959.** fig., 4 refs. **DWB, DLC**—The doublet 3303 (4P-3S) was observed in the light emitted by sodium clouds ejected from Veronica rockets. Two rockets were fired: one at dusk and the other at dawn. That at dawn was the only one to reveal the presence of the ultraviolet line; the yellow line was observed in both spectra. The observation that the ultraviolet lines appear to be more easily excited at dawn can explain previous failures to detect these lines in the twilight airglow. *Subject Headings:* **1. Corpuscular radiation 2. Artificial sodium clouds 3. Veronica rockets 4. Emission spectrum 5. 3303 Å-line.**—*A. V. and Physics Abstracts.* Ⓢ

TEMPERATURE

See also: **Absolute minimum temp., Antarctic** (Alt), 11.4–23; *see* 8 articles on **frost protection,** 11.4–38 to 11.4–45; **Freezing effects on concrete pavement** (Brock), 11.4–64; **Upper atmos. temp.** (Kovalevsky), 11.4–103; **Temp. slide rules** (Casswell), 11.4–189; **Upper troposphere temps.** (Chiu), 11.4 223; **Frost effects on soil** (Henin), 11.4–254; **Temp. gradient over ice, Greenland,** (Hamilton), 11.4–295; **Temp. effects on groundnuts** (Bolhuis, De Groot), 11.4–297.

11.4–249 551.524.2:551.468(73)

Bernstein, Abram B. and Hosler, Charles R. (*both, Office of Met. Res., U. S. W. B., Wash., D. C.*), **Temperature patterns along the Atlantic and Gulf coasts.** *Monthly Weather Review*, Wash., D. C., 87(11):395–400, Nov. **1959.** 5 figs. **DWB, DLC**—As part of a recent survey of coastal climates of the U. S., a study was made of air temperature patterns along the Atlantic coast and the Gulf of Mexico. This investigation serves as an example of the type of local climatological analysis that can be performed using existing data, without the need for setting up new and often costly observational programs. In addition, this study showed an interesting feature of the daily maximum temperature pattern— an "inland tongue" of high temperature—

hat does not appear on large scale maps of temperature distribution for the U. S. The data in his study were the average daily mean, maximum, and minimum temperature for approximately 500 cooperative observing stations, as well as first order Weather Bureau stations, along the Atlantic and Gulf coasts. Sources of data were **Climatic Summary of the United States**—Supplement for 1931 through 1952 and **Local Climatological Data,** published by the U. S. Weather Bureau. Figs. 1 and 2 show the networks of stations along the Atlantic and Gulf coasts, respectively. Although the station network used in this study is quite dense, there were three major sources of difficulty. First, the various cooperative observing stations do not have a uniform period of record. An attempt was made to overcome this problem by eliminating stations with short records (less than 5 years), and stations with inconsistencies caused by changes in station location. Second, stations are not equally distributed over different kinds of terrain—for example, there are few stations high up on mountain slopes—and there are differences in the temperature statistics due to differences of station exposure. To compensate for this, subjective smoothing was done in drawing isotherms. Also analyses of regions of sparse data were made in accordance with the temperature-altitude relationship which was evident in regions of dense data. Third, the absence of observations of air temperature over water made it difficult to analyze coastal areas and regions with inland bodies of water such as Long Island Sound, Chesapeake Bay, and Lake Ponchartrain. Despite these data deficiencies, the networks were sufficiently dense to delineate features of the temperature patterns caused by local topographical features and bodies of water. *Subject Headings:* **1. Temperature patterns 2. Atlantic Coast 3. Gulf Coast.**—*Authors' introduction.*

11.4–250 551.524.34:551.583.14(776)

*†Baker, Donald G. (*Univ. of Minnesota*), **Temperature trends in Minnesota.** *American Meteorological Society, Bulletin,* 41(1):18–27, Jan. **1960.** 5 figs., 4 tables, 39 refs. **DWB**—The change in average summer, winter, and annual temperatures of 19 Minnesota stations was investigated. Records were studied for a uniform number of years for comparative purposes as well as for the total period of record. Seven of the stations were believed to qualify as climatic reference stations, 11 had records of intermediate reliability, and one was included solely for its long record dating from 1819. Based on the linear-regression equation, the climatic reference stations showed an average increase in summer (1900 to 1958), winter (1900 to 1958), and annual (1900 to 1957) temperatures of 1.4, 3.7, and 1.3°F, respectively. These rises were equivalent to 2.4, 6.3, and 2.2°F per century. Stations of intermediate value generally did not show such large increases. Slopes of the temperature regression lines were generally significantly greater than zero for the reference stations and for a few of the others. Records for longer periods showed similar results. The St. Paul record, originating in October 1819, indicated that the central date of the smoothing period in which summer, winter, and annual temperatures reached a minimum was in 1863, 1854, and 1865, respectively. The latter date appeared to be anomalous compared to east coast records. Recent summer, winter, and annual maxima were obtained in 1934, 1943, and 1933–34, respectively. Winter maximum temperatures at some other Minnesota stations occurred in the early 1930's. *Subject Headings:* **1. Temperature trends 2. Minnesota.**—*Author's abstract.*

11.4-251 551.524.371:632.111.5

Jenny, Jean, **Quelques notions fondamentales sur les mesures de protection prises contre les gelées.** [Some fundamental notions about protection against frosts.] *Lausanne. Stations Fédérales d'Essais Agricoles, Publications,* No. 577, Sept. **1958.** 12 p. 9 figs., 5 refs.—After reviewing the principal methods of frost protection, the author investigates the temperature regime close to the ground as well as along the plant from trunk to limbs, from limbs to twigs, and then to buds and leaves; the effect of sprinkling for protection against frosts; measurement of the cooling rate of buds after each spraying; and ice formation. These measurements are said to be necessary in order to determine the rotation rate of sprinklers. *Subject Headings:* **1. Frost protection methods 2. Sprinkling method 3. Plant temperatures.**—*A. V.*

11.4–252 551.524.371:632.111.5

†Jenny, Jean, **Quelques données techniques sur les méthodes de lutte contre le gel.** [Some technical data on the methods of protection against frost.] *Lausanne. Stations*

Fédérales d'Essais Agricoles, Publications, No. 573:557–574, Nov. **1958.** 9 figs., 23 refs. French summary.—Survey of elements, the knowledge of which is essential in order to carry out frost protection with maximum efficiency and minimum expense. The processes may be classified in three groups: preventive and cultural barriers for diverting cold air currents; selection of the area devoted to culture; utilization of screens for limiting the losses through radiation, evaporation, convection and cold breezes as well as air stirring, heating and spraying. In the spraying method, water supply ought to be adjustable and the sprayed water must be spread evenly on all the sensitive parts of plants: buds and flowers. Water supply must be adjusted according to the area of the surfaces emitting radiation, the temperature and the humidity of air, the wind force and the nature of the ground. *Subject Heading:* **1. Frost damage prevention.**—*A. V.*

SOIL TEMPERATURE

See also: **Soil freezing** (Bayerle), 11.4–47.

11.4–253 551.525.5(234.9)

Ermakov, A. V., **Merzlotnye formy rel'efa na Kavkaze.** [Relief forms due to frost action in the Caucasus.] *Priroda*, Moscow, No. 10:114–115, Oct. **1958. DLC**—The author describes extensive frost structures observed in the mountainous part of Kazbek. The locality Lendzhis, situated in the foothills of the eastern slope of Kazbek, which is covered by permanent snow and glaciers, is an extensive bottom of an ancient glacial trough formerly occupied by the Ortsver Glacier. A large part of the bottom is covered with small hillock-shaped forms of frost protuberances resembling the microrelief of tundra. The height of individual hillocks is about 30–40 cm and their diameters do not exceed 50 cm. Where the slope of the bottom increases to 8–10°, the surface is dissected into a series of frost fissures with a width of 10–20 cm and a depth of 30–50 cm. They form dense network tetragonal polygons having a mean length of 80 cm. East of Kazbek, on the watershed of the Chkhera and Gergetka Rivers at 2100 m, there is situated a concave depression where polygonal structures in the shape of five or six sided polygons enclosing between them shallow (10–15 cm) fresh crevices 3–5 cm wide are disrupted by grass. *Subject Headings:* **1. Frost action phenomena 2. Caucasus.**—*I.L.D.*

11.4–254 551.525.5 551.524.37:631.4

Henin, Stephane (*France*), **Etude sur le gel du sol.** [Study on soil freezing.] *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957* [*Transactions*], Vol. 4, pub. **1958.** p. 259–265. 2 tables, 5 refs. **DWB, DLC**—The formation and effects of ice on soils are discussed on the basis of field experiments in the Paris region and central France. The behavior of a soil on freezing depends on moisture content, degree and speed of cooling, structure, and initial degree of heterogeneity. *Subject Headings:* **1. Frost effects on soil 2. Soil freezing.**—*From SIPRE abstract.*

PRESSURE AND WIND

PRESSURE

See also: **Pressure change effects on automobile accidents** (Fischer et al.), 11.4–60; **Pressure effects on sea level** (Lacombe, Lizeray), 11.4–176; **Particle trajectories in some pressure systems** (Kao, Neiburger), 11.4–230.

11.4–255 551.543:551.553(65)

Seltzer, P., **Sur les différences de pression entre le Cap Bougaroni et Philippeville.** [The pressure differences between Cape Bougaroni and Philippeville.] *La Météorologie*, Paris, Ser. 4, No. 54:115–119, April/June **1959.** 5 figs., 2 tables. French, English and Spanish summaries p. 115. **DWB**—The sea level pressures measured at the signal station of Cape Bougaroni are

lower than those measured at Philippeville situated 50 km to the southeast. The difference, in case of strong westerly winds, attains the order of 5 mb. If the differences calculated from the observations made from September to Dec. 1958 are considered, a diurnal regime, opposite to that of pressure is noticed. The diurnal variation of pressure is therefore smaller at Cape Bougaroni than at Philippeville. Finally the observations have been classified as a function of the wind velocity and direction; and the pressure differences for each classified group have been calculated. It appears that: a) For winds from N or E, the pressure differences vary only slightly with the wind velocity; b) For winds from S or W, the pressure differences increase sharply with the wind velocity. This well known phenomenon has been studied and described by A. BALDIT; it is an orographic effect. Other similar cases have recently been observed in France. *Subject Headings:* **1. Pressure distribution 2. Diurnal pressure variations 3. Pressure-wind relationships 4. Cape Bougaroni, Algeria 5. Philippeville, Algeria.**—*Author's abstract.*

WIND

See: **Wind chill tables,** 11.4-61; **Wind effects on radiometers** (Portman, Dias), 11.4–204.

TURBULENCE

See also: **Turbulence effects on airplanes** (Etkin), 11.4–35; **Microseisms from wind fluctuation** (Rocard), 11.4–171; **Turbulence instrumentation** (McCormick), 11.4–207; **Boundary layer** (Wippermann), 11.4–233.

11.4–256 551.551.21:551.508.54:536.53

†Cramer, H. E. (*M.I.T., Mass.*), **Measurements of turbulence structure near the ground within the frequency range from 0.5 to 0.01 cycle sec^{-1}.** *Advances in Geophysics,* N. Y., Vol. 6, pub. **1959.** p. 75–96. 12 figs., 4 tables, 22 refs., 12 eqs. **DWB, DLC**—Comprehensive measurements of the space and time variations in the orthogonal components of wind velocity at a height of 2 m were obtained from records of five bivanes equipped with heated-thermocouple anemometers during Project Prairie Grass. These data have been processed to obtain spectral estimates of Eulerian scales of turbulence within the frequency range from about 0.5 to 0.01 cycle sec^{-1}. Analysis of results for twelve experiments shows that space spectra within this frequency range are dominated by fluctuations in the u- and v-components which tend to have equivalent transverse and longitudinal dimensions at high frequencies in all thermal stratifications. This equivalence decreases slowly with decreasing frequency in unstable stratification; in stable stratification, the longitudinal dimensions for both velocity components increase rapidly relative to the transverse dimensions as the frequency decreases. Scale estimates show an approximate linear relation with inverse wave number over the entire frequency range. It is demonstrated that the Eulerian space and time correlation functions for unfiltered data are connected by the substitution $x = Ut$ and that a two-thirds power law fits both correlation functions at high levels of turbulence (unstable stratification). *Subject Headings:* **1. Turbulence structure 2. Project Prairie Grass.**—*Author's abstract.*

11.4–257 551.551.5

†Clodman, Joseph and Ball, John T., **Clear air turbulence.** N. Y. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract AF 19(604)-3068, Final Report, June **1959.** 48 p. 18 figs., 5 tables, 51 refs., eq. **DWB**—The literature of clear air turbulence is reviewed critically. The anisotropy of high level turbulence is investigated qualitatively by means of simultaneous subjective reports and airspeed cell measurements. It is concluded that anisotropy sometimes occurs, especially in the stratosphere, and that aircraft bumpiness may be caused by horizontal gusts. An investigation of the association between moderate topography and high level turbulence shows nearly conclusively that there is an association and that it is related to the wind at 850 mb. *Subject Heading:* **1. Clear air turbulence.**—*Author's abstract.*

WIND DISTRIBUTION AND VARIATION

See also: **Air particle oscillations and trajectories** (Kao, Neiburger), 11.4–230; **Pressure-wind relationship** (Seltzer), 11.4–255.

11.4–258 551.553.11:632.187(943)

*Whittingham, H. E., **The behaviour of the sea breeze in the forest areas of southeast Queensland.** (In: Fire Conference, Melbourne, Australia, July 1958, **Proceedings,** issued Melbourne, **1958.** Conference Paper, No. 15 (40 p.). 14 figs., 13 tables, 14 refs., 2 eqs.) (Reprint p. 98–137 from unidentified source.) **DWB**—An interim report is submitted of an investigation into the behavior of sea breezes in southeast Queensland and their influence on fire weather conditions. Some theoretical aspects of the sea breeze are considered, and also factors affecting its development, type, time of onset and its extent, with particular application to southeast Queensland. *Subject Headings:* **1. Sea breezes 2. Wind effects on forest fires 3. Fire weather conditions 4. Queensland, Australia.**—*Author's abstract.*

11.4–259 551.555.4:551.558.21

Ferrari, Guido Antonio, **Carte des zones d'ascendance de nature ondulatoire, par tramontane dans le Latium (Italie Centrale).** [Charts of undulatory up-draft zones during the tramontana in Latium, Central Italy.] *Schweizer Aero-Revue,* Zurich, 35(1):53–55, Jan. **1960.** 3 figs. **DLC**—Tramontana is a wind blowing from the north over the Latium (Central Italy) after it has crossed, almost perpendicularly, the Apennines. This article is a study of the formation in this region of up-drafts due to wave phenomena, and which appear with a great regularity whenever this wind regime prevails. Based on a score of flights (total duration about 95 hrs) made in 1955 and 1956, the author compiled a chart of ascending waves in Latium. He describes the wind regime and the cloud system. The wave motions are due to the first sharp rise in the Apennines which constitutes the first obstacle for the tramontana. These motions are next amplified or damped by the succeeding waves depending on their relative positions. The waves become regular after they have passed over all of the ridges. Over flat country, the wave-like up-drafts appear in well defined zones and occur in the lee of the last mountain ridge. *Subject Headings:* **1. Up-draft zones 2. Orographic waves 3. Tramontana 4. Latium, Italy.**—*A. V.*

WIND EFFECTS

See: **Wind effects on insect migration** (Williams), 11.4–16; **Wind stress on water** (Ichiye), 11.4–175; **Wind-wave relationships in typhoons** (Unoki), 11.4–179.

UPPER AIR WINDS

See also: **Upper air wind data, Angola** (Espírito Santo), 11.4–14; **Auroral drift** (Omholt), 11.4–120; **Rocket wind measurement** (Faust), 11.4–146; **Upper air wind measurement** (Jenkins, Webb), 11.4–190; **Upper troposphere winds** (Chiu), 11.4–223; **Nonadiabatic cooling in jet stream region** (Kleinschmidt), 11.4–225; **Upper air wind** (Barov, Angelov), 11.4–237.

11.4–260 551.557.3:551.509.311(67)

§Nevière, E., **Relations entre les courants rapides et les types de temps en Afrique Equatoriale.** [Relationships between rapid currents and weather types in Equatorial Africa.] *France. Météorologie Nationale, Monographies,* No. 14:12–30, **1959.** 15 figs., tables. **DWB**—The synoptic charts plotted for the standard 700, 600 and 500 mb levels give evidence of rapid wind currents appearing like more or less continuous ribbons, about 1500 km long and 2 to 6 lat. degrees wide. Their thickness is variable, sometimes in the range of 2000 to 3000 m, sometimes reduced to an isolated nucleus a few hundred meters thick. In order to find a possible relationship between the existence of these rapid currents and certain weather types in Equatorial Africa, the author prepares charts of strong upper air winds observed over the Belgian Congo, French Equatorial Africa and the Cameroons. He makes vertical sections following an almost north-south axis and an approximately east-west axis; isotaches are drawn

ery 5 kn. Analysis of these vertical sections shows two well marked features of the rapid uatorial currents: a) morphological resemblance to low speed polar and subtropical jet reams; b) existence of nuclei with abnormally high speed. An attempt is made to explain e phenomena and forecast rules are stated: 1) The northern rear zones of equatorial disrbances are characterized by the presence of rapid currents and wind nuclei with abnormally gh speed; 2) these rapid currents and wind nuclei with abnormally high speed make it ossible, even when no organized disturbance is visible, to forecast its formation with great rtainty. This will appear at the forefront of the strong wind zone whose displacement must e extrapolated. *Subject Headings:* **1. Upper air winds 2. Upper air circulation 3. Equatorial t streams 4. Equatorial disturbances.**—*A. V.*

VERTICAL MOTION

See: **Convective motion** (Tippelskirch), 11.4–227; **Convective currents** (Zierep), 11.4–228; **Divergence and diffluence in vertical motion** (Deguillaume), 11.4–231; **Up-draft zones** (Ferrari), 11.4–259.

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See also: **Intertropical front-dew point relationships** (Nevière), 11.4–240.

11.4–261 551.571:534.3

Leipp, Emile, **Le degré hygrométrique de l'air ambiant: paramètre sensible du spectre d'une corde harmonique en boyau.** [Humidity of ambient air: sensitive parameter of the harmonic catgut string spectrum.] *Académie des Sciences, Paris, Comptes Rendus,* 249(20): 2014–2016, Nov. 16, **1959.** 2 figs., 2 refs. **DWB, DLC**—Experimental study of the longitudinal frequency fluctuations of a harmonic string (strings of musical instruments) with respect to the fluctuations of air humidity. Description of the experimental device and statement of the results. The longitudinal frequency of the nylon, steel and varnished catgut string is practically independent of the humidity of the ambient air. Longitudinal frequency of the natural catgut string is, on the contrary, a function of the ambient air humidity; it varies from 1640 to 1960 Hz when the relative humidity varies from 90 to 30%. When humidity increases, one observes an alteration of the quality and a change to low-pitched tones; this is an almost linear law. *Subject Headings:* **1. Acoustics 2. Humidity effects on sound.** —*A. V.*

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Transpiration and crop yields** (deWit), 11.4–37.

11.4–262 551.573:581.11:631.67 551.585

†Garnier, B. J., **Potential evapotranspiration and its use in agricultural development.** (In: West African Cotton Research Conference, Samaru, N. Nigeria, Nov. 18–23, 1957, **Proceedings,** Pub. **1959.** p. 197–204. 4 figs., 2 tables, 20 refs. Pub. by Ministry of Agriculture Samaru, Zaria and printed by Gaskiya Corporation Zaria, N. Nigeria.)—The article explains the concept of potential evapotranspiration. It reviews some uses to which the water balance concept can be put in agriculture: 1) the classification of climates; 2) calculation of the average length of the growing season without irrigation; 3) planning of irrigation development schemes; 4) planning day-to-day irrigation; 5) arrangement and prediction of harvest dates. These examples are accompanied by tables, graphs and figures containing data from Nigeria and Salem (Seabrook, N. J.). *Subject Headings:* **1. Potential evapotranspiration 2. Water balance 3. Climatic classification 4. Irrigation.**—*A. V.*

11.4–263 551.573:581.11:778.3

Sivadjian, Joseph, **Dosage hygrophotographique de la transpiration de l'arachide.** [Hygrophotographic titration of peanut transpiration.] *Oléagineux*, Paris, 15(1):1–4, Jan. **1960.** 6 figs., 3 refs. **DLC, DA**—This article on the study of peanut transpiration reviews the measurement methods used and the results obtained. In order to determine the quantity of water from transpiration, the author compares the hygrophotographic recording from contact with the leaves to a densitometric scale with 6 discoloration stages corresponding to well defined smaller and smaller quantities of water. Peanut leaves show more abundant transpiration on their upper sides than on their lower ones. The folioles of leaves remain horizontal when shaded during the day, but become upright when exposed to the sun. This movement prevents an excessive increase of transpiration, owing to intense radiation. This increase, for the two sides, does not exceed 0.5 μg a minute for a 1 sq. mm surface. *Subject Headings:* **1. Hygrophotographic plates 2. Evapotranspiration 3. Transpiration of peanuts.**—*A. V.*

11.4–264 551.573:551.508.72

Stork, C., **Evapotranspiration problems in Iraq.** *Netherlands Journal of Agricultural Science*, Wageningen, 7(4):269–282, Nov. **1959.** 7 figs., 2 tables. **DA**—This article, which is a study on evapotranspiration in Iraq, opens with a brief description of the experimental station of Dujailah. The actual net irrigation requirement of the inundated, irrigated and drained plots is compared with empirical and theoretical methods based upon climatic conditions. In general the Penman formula seems to be in agreement with the empirical results of Dujailah experimental fields. Thornthwaite's formula, like Blaney and Criddle's method, is based on a correlation between radiation and temperature, but since this formula has no crop coefficient in which other factors influencing the evapotranspiration can be included, no practical results can be drawn. Evaporation pans are subject to the energy balance of the pan concerned in which are included wind, rim, edge, oasis effect and the energy taken up or delivered by the body of the pan. The Piche evaporimeter was found unsuitable for Iraq on account of the high evaporation rate, while the Livingstone atmometer showed no single relationship with anything at all. The determination of evapotranspiration from the Dujailah experimental fields showed that Penman's formula can be used after more detailed knowledge has been collected on this subject. Hitherto, almost all projects in Iraq have been based on the Blaney and Criddle equation with crop coefficients as used in the U. S. which results in a substantial difference in the area irrigable during summer and winter, the capacity of the water distributing system, and the drainage requirement after reclamation. *Subject Headings:* **1. Evapotranspiration 2. Evapotranspiration estimates 3. Evaporimeters 4. Dujailah station, Iraq.**—*A. V.*

CONDENSATION

See also: **Freezing level of convection clouds** (Dessens), 11.4–268; **Ice crystal effects on halos** (Visser), **11.4–301.**

11.4–265 551.574.1

Mason, B. J., **Recent research on cloud physics at Imperial College, London.** *Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti*, pub. Dec. **1958.** p. 64–75. 10 figs., 5 refs. English, French, Italian and German summaries p. 74–75.—This report summarizes some recent research, at Imperial College, London, on the supercooling and freezing of water, the properties of natural and artificial ice nuclei, and on the growth of snow crystals in the laboratory. Heterogeneous nucleation has been found for water droplets containing small foreign nuclei and proportionality could be established between the logarithm of the droplet and its freezing temperature. Spontaneous nucleation, on the other hand, was homogeneous. Empirical relationships between droplet volume and nucleation temperature, for both heterogeneous and homogeneous nucleation have been established for a wide range of droplet sizes. Photos are shown of the bursting of water droplets and of spicules formed during freezing. Tables are presented of substances (mainly silicates and minerals of the clay and mica groups) found to be initially active as ice nuclei at

nperatures above −18°C, and of artificial ice nuclei, with their crystal structure, lattice rameters and threshold temperatures. However, if all traces of silver or free iodine are noved, many of the substances are found to be quite ineffective. The most effective nucleat- g agents are, like ice, hexagonal crystals in which the lattice spacing differs from that of ice less than 10% and they are almost insoluble in water. Perfect orientation of ice crystals s so far been observed on the basal faces of silver iodide, lead iodide, cadmium iodide, pric sulphide and freshly-cleaved mica, and on the (001) plane of iodine. Finally, the sults are summarized of experiments on the artificial growth of snow crystals on a thin fibre, vering a temperature range of 0°C to −50°C and supersaturation varying from a few % about 300%. Radical changes in crystal shape could not be produced by varying the persaturation at constant temperature but were produced by temperature changes at nstant supersaturation. *Subject Headings:* **1. Cloud physics 2. Freezing nuclei 3. Silver ide nuclei 4. Cloud seeding substances.**—*A. V.*

11.4–266 551.574.1:551.578.7:551.515.4

Mügge, R., **Nouvelles recherches sur la physique et la dynamique des nuées orageuses.** [New research on the physics and dynamics of thunderstorm clouds.] *Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti,* pub. Dec. **1958.** p. 59–63. fig. French, Italian, English and German summaries p. 62–63.—At the University Institute of Meteorology and Geophysics in Frankfurt a.M., H. W. Georgii has investigated the relations of the freezing nuclei and the large and giant nuclei of the atmospheric aerosol by means of a cold chamber of 80 liters. He has also considered the much more numerous condensation nuclei (Aitken nuclei). The special conditions prevailing at the Taunus Observatory at 800 m elevation have been compared to those in the Rhein-Main plain at Frankfurt, where the influence of anthropogenous air pollution by industry is remarkable. The results concerning the size of aerosol particles and the ice formation allow only a few conclusions on the special conditions in storm and hail clouds, except that in very high cloud tops the large amount of Aitken nuclei participates in the freezing process below −30°C. The results are supplemented by some general remarks drawn from synoptic meteorology on the possibility of thunderclouds to release hailstorms. *Subject Headings:* **1. Cloud physics 2. Freezing nuclei 3. Aitken nuclei 4. Aerosols 5. Thunderstorm formation 6. Hail formation.**—*Author's abstract.*

11.4–267 551.574.1:551.576.1:551.594.12

Twomey, S. (*Radiophysics Laboratory, Sydney, Australia*), **The influence of droplet concentration on rain formation and stability in clouds.** *Puy de Dôme. Observatoire, Bulletin,* No. 2:33–41, April/June **1959.** 2 figs., 2 tables, 11 refs. French and English summaries p. 33. **DWB**—Increase of cloud droplet concentration must necessarily lead, other things being equal, to a reduction in droplet size, and hence altered terminal velocities and collection efficiencies. It is shown theoretically that variations of droplet concentration within the range found in natural clouds can thereby modify drastically the stability of the clouds and their ability to produce rain. It is concluded that clouds containing 50–100 droplets cm^{-3} can produce rain fairly easily, whereas clouds with higher droplet concentration will produce rain only with difficulty. Since electrification may modify the collection efficiency of small droplets, it is accordingly suggested that electric effects following ice formation in supercooled clouds may in many instances be more important for rain formation than the Bergeron-Findeisen sublimation mechanism. *Subject Headings:* **1. Rain formation 2. Cloud droplets 3. Coalescence of drops 4. Electric effects during ice formation.**—*Author's abstract.*

FOG

See: **Fog drop size** (Godard), 11.4–208; **Fog dissipation** (Serpolay), 11.4–216.

CLOUDS

See also: **Cloudiness at German airports** (Guss), 11.4–32; **Cloud droplet size** (Godard), 11.4–208; **Cloudiness, Lower Danube Plain** (Kacvinský, Priadka), 11.4–244; **Droplet concentration influence on cloud stability** (Twomey), 11.4–267.

11.4–268 551.576.1:551.574.1:778.38 551.578.77

Dessens, Jean, **Niveau de congélation des nuages convectifs équatoriaux.** [Freezing level of equatorial convection clouds.] *Puy de Dôme. Observatoire, Bulletin*, No. 3:73–80 July/Sept. **1959.** 4 figs., table, 9 refs. French and English summaries p. 73. **DWB**—The freezing level of the cumulus congestus in the Congolese equatorial basin has been determined through photogrammetry. Two methods were used: a) in the course of the same day, one can observe two sorts of cumulus congestus—one giving towers which rise up to a height H_1, and neither freeze nor subsist; others giving towers which rise up to a height H_2 and set; freezing level H is between H_1 and H_2; b) when the towers are congealed, the aqueous part of the cloud evaporates much faster than the frozen part, and soon afterwards there remains only an anvil with almost horizontal base which indicates the freezing level. Measurements made in December 1958 show that the altitude of the freezing level remains almost the same (near 10,500 m). The freezing level isotherm, equal to $-35°C \pm 2°C$, seems to indicate the absence of efficacious freezing nuclei. The clouds of the Congolese basin (Lukolela region) evolve as if no freezing nuclei existed; this does not keep them from producing very strong showers, but they almost never produce hail. This result does not confirm the hypothesis that hail is due to a low freezing nuclei content, and that the occurrence at the $-35°C$ isothermal level constitutes a circumstance unfavorable to the growth of hailstones. *Subject Headings:* **1. Freezing level determination 2. Photogrammetric method 3. Freezing nuclei 4. Hail formation 5. Belgian Congo.**—*A. V.*

11.4–269 551.576.11:778.33

†Conover, John H., **Cloud patterns and related air motions derived by photography.** Blue Hill Meteorological Observatory, Milton, Mass., Contract AF 19(604)-1589, Final Report, June **1959.** 268 p. 319 figs. (incl. photos), 2 tables, 26 refs., eqs.—Under conditions of strong winds a banded structure of the troposphere, approximately parallel to the wind, may be revealed by clouds at any level. The following band types and their approximate dimensions were found at cirrus levels: large scale, 100 mi apart and up to at least 350 mi long; major bands 2.3 mi apart and up to at least 80 mi long; minor bands 0.2 mi apart and a few miles long. At altocumulus levels major bands are found. Sharp edges to extensive cirrus sheets or banded cirrus are generally found a few miles south of the jet stream core. "Streaky" cirrus denotes jets to the north and south. When banded or "streaky" cirrus is observed 50% of the time it lies on the warm side and within 200 mi of the jet core and in the entrance or neutral regions. Horizontal vortices, approximately parallel to the wind, through which the air flows in a helical motion create the major cloud bands. Adjacent vortices rotate in opposite directions. Cloud forms between vortices in rising air and spreads laterally, depending on the average shear and lapse rate through the layer of cloud formation. Cumulus cloud streets appear to be unaffected by irregularities of at least 700 ft in the earth's topography; they generally form in vortices of like rotation, the intervening vortices apparently are wiped out by the prevailing horizontal shear. The sea breeze may cause lifting to at least 16,000 ft as shown by stationary clouds at that level. Thunderstorm roll clouds rotate upward on the advancing side about a horizontal axis. Vertical motions dangerous to aircraft, operating at levels in which these rolls form, may be encountered. *Subject Headings:* **1. Cloud formation 2. Cloud photography.**—*Author's abstract.*

11.4–270 551.576.2:551.509.318:551.324.4(988)

§Carpenter, Clarence A. (*Air Wea. Service, U. S. A. F.*), **The relation between cloudiness over the Greenland icecap and synoptic weather types.** *American Meteorological Society, Bulletin*, 41(2):68–78, Feb. **1960.** 14 figs., 8 refs. **DWB**—This paper is a summary of cloudiness over the Greenland Ice Cap route from Sondrestrom Air Base, approximately 67°N–51°W, to Angmagssalik, approximately 65°5′N–37°5′W. Four types of synoptic systems were

sen and cloudiness summarized by types both annually and for the summer season. Total udiness annually and for the summer season without regard to synoptic types is also pre- ted. Data for this paper consisted of 511 flight cross sections made by Scandinavian Air- s System flight crews in scheduled air service over the Ice Cap route. It is presented in the m of the cross section grid with isopleths showing the percentage of time cloudiness was served at each grid point. These cross sections are of particular value in that they are the t source of systematic, observed weather data over this area. An attempt is made to lain Ice Cap cloud distribution by correlation with system type in order to provide a actical forecasting aid for the Greenland air-route forecasters. *Subject Headings:* **1. Cloudi- ss-synoptic weather type relationships 2. Cloudiness forecasting 3. Sondrestrom Air se-Angmagssalik air route 4. Greenland Ice Cap.**—*Author's abstract.*

PRECIPITATION

See: **Precip. probability, North Central States** (Barger et al.), 11.4–13; **Precip. normals, U.K.,** 11.4–15; **Precip. utilization** (Mayer), 11.4–186; **Radar precip. echoes** (Koteswaram, De), 11.4–192.

RAIN, SNOW AND HAIL

See also: **Snow surveys, U.S.S.R.** (Antimonov), 11.4–18; **Snow cover, Kirovsk** (Anisimov), 11.4–19; **Snow surveying, Western U. S.** (Colby), 11.4–20; **Snow survey data,** 11.4–183; **Hailstorms, Netherlands** (DeJong), 11.4–239; **Hail formation** (Mügge), 11.4–266; **Hail formation** (Dessens), 11.4–268.

11.4–271 551.578.41

Jellinek, Hans H. G., **Compressive strength properties of snow.** *Journal of Glaciology,* ondon, 3(25):345–354, March **1959.** 7 figs., 7 tables, 6 refs., 2 eqs. **DWB, DLC.** Also sued as: *U. S. Snow Ice and Permafrost Research Establishment, Research Report,* No. 34, ug. **1957.** 16 p. 9 figs. (incl. photos), 7 tables, 6 refs., 2 eqs. **DLC**—The strength of snow linders prepared in the laboratory (radius 2.19 cm, height 10 cm, densities about 0.548–.552 g/cm³) was measured with a Carver hydraulic laboratory press and a Baldwin load cell —10C. Tests of cylinders made from unfractionated snow showed a strength decrease ith age of snow. A similar age effect was observed for cylinders made of snow fractionated cording to particle size, ranging in one test from 8–9 kg/cm² for 0.8-mm particles to 4 kg/cm² r 0.2-mm particles. An equation describing the effect of age on compressive strength is ven which closely resembles the equation for a 1st-order chemical reaction. Snow cylinders eated with NH_3 showed a considerable decrease in compressive strength, while cylinders eated with CO_2 and CH_4 showed no appreciable change in strength. *Subject Heading:* **. Snow strength.**—*SIPRE abstract.*

11.4–272 551.578.41

Jellinek, Hans H. G. and Schlueter, W. (*both, SIPRE, Corps of Eng., U. S. Army, Wilmette, ll.*), **Particle-size distribution of pulverized snow.** *Journal of Glaciology,* London, 3(26):512–21, Oct. **1959.** 15 figs., 3 tables. English, French and German summaries p. 512. **DWB, DLC.** Also issued as: *U. S. Snow Ice and Permafrost Research Establishment, Research Report,* 9, May **1957.** 8 p. 15 figs., 3 tables, eqs. **DWB**—Development of a micrometric-statistical ethod for determining size distributions is described. Screened samples were measured in a old room with a filar micrometer using filtered and cooled light and finely ruled glass slides mmersed in silicone oil. Products of maximum and minimum diameters ("areas") were then lotted in a cumulative percentage curve, and a derivative distribution curve was obtained by raphical differentiation with respect to area. Experimental trials showed that minimum epresentative sample size is 200 particles, and that faster but slightly less accurate determina- ions can be made by estimating particle size. *Subject Headings:* **1. Snow crystal-measurement echniques 2. Snow crystal structure.**—*SIPRE abstract.*

11.4–273 551.578.41 551.578.4

Jellinek, Hans H. G., **Thin section analysis.** *U. S. Snow Ice and Permafrost Researc Establishment, Research Report*, 35, July **1957.** 14 p. 2 figs., 9 refs., 18 eqs. **DWB**—Deriva tions are developed to permit application of thin section analysis, similar to that employed geology and mineralogy, to the special problem of determining particle size distribution snow from sections cut through the snow. Equations are derived to permit transformatic of data from either 1-dimensional random cuts (chords) through the particle cross sections from 2-dimensional cuts (cross-sectional areas) of the particles. The case for the rectangul distribution and the case for the normal distribution are discussed in the appendix. *Subje Headings:* **1. Snow crystals measurement techniques 2. Snow crystal structure.**—*SIPR abstract.*

11.4–274 551.578.42:551.578.46(437

*Konček, M. and Briedóň, V., **Snehové pommery Vysokych Tatier.** [Snow distributio over the High Tatra Mountains.] *Geografický Časopis*, Bratislava, 11(1):3–42, **1959.** 1 figs., 17 tables, 8 refs. Russian and German summaries p. 38–42. **DLC**—Statistical study snow cover in the High Tatra Mts. based on 30 yrs of observation (1921–1951). Data an given on the distribution of duration of snowfall and snow cover; depth of the snow layer durin winter; number of days with snowfall and days with depth of snow from 1 to 50 cm. Frequenc of snow layer and depth during winter is presented for Stary Smokovec. The study reveal some new climatic characteristics. On the tops of the High Tatras snow cover is normall observed in September and disappears in June. The formula of CONRAD for the eastern Alps $D=23+0.1$ h is valid for the southern side in the lee of the High Tatras. From 1500 m on wards, the variation of the number of days with snow cover is given by $D=88\pm0.056$ h The depth of the snow layer increases to 1300 m altitude in February. The absolute maximur of snow depth varies from 73 to 400 cm according to place and altitude. At the same altitude the depth of the snow cover is higher and more persistent on the northern side of the Tatra Mts than on the southern side. *Subject Headings:* **1. Snowfall data 2. Snow cover 3. Tatra Mountains.**—*A. V.*

11.4–275 551.578.46:551.583.3(988

Bader, Henri, **Polar ice and snow studies.** *American Geophysical Union, Transactions* 39(1):163–164, Feb. **1958. DWB, DLC**—In 1930–31 SORGE, of the Wegener Expedition explored the "files" of the Greenland Ice Cap at Eismitte and his research gave rise to a qualita tive statement of the relationship of snow density, time, and climate. Sorge's law is: "At any given location in the dry snow region of a glacier, the density of the snow as a function of depth does not change with time unless the climate changes." This has been expanded to include the effects of changes in rate of precipitation and in temperature. Stratigraphic studies in 1956 and 1957, undertaken by SIPRE as part of the U. S. program for IGY, are described *Subject Headings:* **1. Snow studies 2. Climatic variations 3. Eismitte, Greenland.**—*M.L.R*

11.4–276 551.578.46 551.324.433

Court, Arnold, **Selection of "best" snow course points.** *Western Snow Conference April 1958, Proceedings*, 26:1–12, Oct. **1958.** 2 figs., 11 refs. **DWB** (M(06) W527 p)—A precise study of the snow course in Onion Creek, 6100 ft above sea level in the headwaters of the North Fork of the American River (39°15.5 N, 120°22.5 W) has been made. The study is based on two separate but related hypotheses which are stated in the paper. The report covers the history of the investigation, correlations, results and discussions. *Subject Headings:* **1. Snow courses 2. Onion Creek, Calif.**—*N.N.*

11.4–277 551.578.46(439.1)

Kéri, M. and Salamin, P., **Le changement de la densité de la neige en Hongrie.** [Varia tions in snow density in Hungary.] *International Union of Geodesy and Geophysics. Assoc. of Scientific Hydrology, Toronto, Sept. 1957*, [*Transactions*], Vol. 4, pub. **1958.** p. 185–209 13 figs., 6 tables, 11 refs. **DWB, DLC**—Temporal and geographical variations in snow density and influencing factors are examined on the basis of observations from 1954–1956 in the moun tains, plains, and cities, and the general snow conditions are described. Snow density varies

ively little throughout the country: the density differences of 80% of the samples did not ed 0.1 kg/cu m. A minimum density of 0.09–0.12 kg/l was recorded for new snow and a imum of 0.36–0.40 kg/l for a thick snow cover in the last stages of melting. The highest sities in the mountains were observed on south slopes, medium densities in plateau areas the bottom of valleys, and the lowest on north slopes. Density decreased considerably n elevation and duration from 0.378 kg/l at 350 m to 0.287 kg/l at 850 m. Snow densities e highest in meadows and pastures surrounded by forests, and least in forests of medium age. lose correlation was found between decrease in depth and density, a decrease of 1 cm in w thickness corresponding approximately to an increase of 0.01 kg/l in density. A method stimating changes in snow density is described. *Subject Headings:* **1. Snow density varia- s 2. Hungary.**—*SIPRE abstract.*

11.4–278 551.578.46:551.588.2(71)

*Williams, G. P. and Gold, L. W., **Snow density and climate.** *National Research Council Canada. Div. of Building Research, Research Paper*, No. 60, July **1958.** 4 p. 2 figs., ables, 16 refs. Reprinted from *Engineering Institute of Canada, Transactions*, 2(2):91–94, y **1958. DWB** (M78.46 N277sn)—This report summarizes the data that have been ected on snow density since 1947 from selected observation stations across Canada. The tionships between snow density and meteorological variables, particularly wind velocity l air temperature, are discussed. From these snow density data, the insulating values of w cover for different regions in Canada are listed. *Subject Headings:* **1. Snow density data Snow cover effects on climate 3. Canada.**—*Authors' abstract.*

11.4–279 551.578.462:551.579

Martinelli, M., Jr. (*U. S. Forest Service, Fort Collins, Colo.*), **Some hydrologic aspects of bine snowfields under summer conditions.** *Journal of Geophysical Research*, Wash., D. C., (4):451-455, April **1959.** fig., 4 tables, 9 refs. **DLC**—Ablation, density, and weather tors were measured at selected snowfields in the Front Range of Colorado during the sum- rs of 1955 and 1956. Water equivalent of ablation and moisture exchange between the nosphere and the snow surface were computed. Ablation varied from 1.1 to 2.8 ft per week. averaged 1.9 ft per week for July, August, and the first half of September. Density of the w increased during the summers, reached a maximum during August, and then decreased wly. For each acre of snow existing on Aug. 1, about 11½ acre ft of water were released by lation during July and August. This amounted to 0.19 acre ft of water per day per acre of w. Sverdrup's equation indicated that net moisture exchange between the atmosphere d the snow averaged less than two per cent of ablation. Proposals are made to sustain eam flow into the summer by constructing barriers to drift additional snow into natural cumulation areas. *Subject Headings:* **1. Snow ablation 2. Water content of snow 3. Snow elt runoff 4. Colorado.**—*Author's abstract.*

11.4–280 551.578.466

Chuter, I. H., **Snow polygons.** *Weather*, London, 14(4):139, April **1959.** photo p. 138. **WB, DLC**—Four photos of snow polygons were taken Feb. 13, 1955 north of the summit of n Llithrig in Snowdonia (2621 ft) with temp. well below freezing and snow frozen hard, and the Torridon area of northwest Scotland on April 4, 1955 at 1200 ft and at 1800 ft with mps. well above freezing. Peculiarities of polygons (size, space, lines of debris, etc.) are ted in relation to exposure and temp. Thawing conditions are best during mild cloudy eather, as warm clear weather may be attended by frozen surfaces due to radiation to clear y. *Subject Headings:* **1. Snow polygons 2. Snowdonia, Wales 3. Torridon, Scotland.** *-M.R.*

11.4–281 551.578.466

Prichudlivye formy snega. [Fantastic shapes of snow.] *Priroda*, Moscow, No. 3:125, March **1958.** 2 figs. **DLC**—Two photographs showing a phenomenon of snow flow analogous the flow of glaciers are presented. *Subject Headings:* **1. Snow creep 2. Snow formations.** *-I.L.D.*

11.4–282 551.578.44

Zamorskiĭ, A. D., **Interesnye formy snezhnogo pokrova.** [Some peculiar forms of sno cover.] *Priroda*, Moscow, No. 12:112–113, Dec. **1958.** 2 figs. **DLC**—Several unusu examples of snow formation observed in Leningrad during the winter of 1956 and April 195 are described with the aid of photographs and a diagram. After several weeks of clear weath without snowfall the snow gradually crept down along the slope of roofs forming sometim long overhangs several meters in length; when it encountered an obstacle it formed sever wave-like folds. The thickness of the overhang diminished from the roof to the end. Duri its creeping the snow was friable with density not more than 0.2 grms/cm^3. In another e ample, masses of hanging snow slid down a plank of a fence and turned around 90°. T possible mechanical condition of snow leading to such formations is discussed. *Subject Hea ings:* **1. Snow formations 2. Snow mechanics 3. Leningrad, U.S.S.R.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Forest hydrology, Freiburg Canton** (Nägeli), 11.4–54, *also* **Sec. F2**, p. 545; **Snow melt runoff** (Martinelli), 11.4–279; **Water resources survey, Truk** (Valenciano, Takasaki), 11.4–289.

11.4–283 551.579:551.482(282.244.3

Chartier, M. M., **Sur les coefficients des fonctions exponentielles reliant les débit maxima des crues aux aires des bassins versants.** [Exponential coefficients used to expres maximum flood discharges as functions of the areas of drainage basins.] *La Houille Blanch* Grenoble, 14 (Spec. No. B):942–951, Dec. **1959.** 4 figs. French and English summaries p. 942 **DLC**—It is well known that, generally speaking, the maximum discharges Q of floods occurrin with the same frequency do not increase as fast as the areas S of the associated drainage basin Attempts were made to express Q as a function of $\sqrt{S}$ by means of coefficients of the typ $A = Q\sqrt{S}$, and later by coefficients of the type $A' = Q/S^{2/3}$, or with similar parameters associate with exponentials of the areas other than $\frac{1}{2}$ or $\frac{2}{3}$. No one coefficient could be accurate in a cases when the geophysical aspects of floods are so extremely varied. But regions or sub regions exist which have sufficient geophysical homogeneity to make it possible to associat floods of a given frequency, and this includes even record floods, with sets of typical value of the coefficients A, A', etc., certain limits being set upon the areas of the drainage basins Record values of A are: 10 to 12 for the Seine Basin, 40 to 50 for the Dordogne, for the Duranc at Mirabeau, for the Lot and even higher for the Tarn and for the Garonne at Toulouse, wit 100 to 175 for certain rivers in the Cévennes. In this paper, which is a summary of a more ex tensive work, the author examines such values together with the factors that govern them an the causes of the exceptions that occur. The work described in this paper involved considerin a very complex and very finely graduated body of natural phenomena. *Subject Headings* **1. Hydrometeorology 2. River basin studies 3. Flood discharges 4. France.**—*Author' abstract.*

11.4–284 551.579:551.482(282.244.3

Henry, M. and Mauchamp, M., **Dix années d'hydrologie sur le Rhône.** [Ten years o hydrology on the Rhône.] *La Houille Blanche*, Grenoble, 14 (Spec. No. B):910–922, Dec **1959.** 10 figs. French and English summaries p. 910. **DLC**—Historical review of the development of the hydrological network of a section of the Rhône during the last 10 years and detailed description of the equipment of limnigraphic and gaging stations. The aim o this paper is to present the results that were obtained and to show what pointers they can give for the study of large basins affected by many factors. *Subject Headings:* **1. Hydrology 2. Rhône River, France.**—*A.V.*

11.4–285 551.579:551.491

*Netopil, Rostislav, **Kasifikace hydrologických roků pravděpodobnosti překrocení ročních stavů hladiny podzemní vody.** [Classification of hydrological years with probable exceeding of annual ground water table.] *Geografický Časopis*, Bratislava, 11(1):43–65, **1959.** 10 figs.,

bles, 14 refs. Russian and German summaries p. 62–65. **DLC**—The characteristics of ological years are determined by the annual value of precipitation, runoff and the annual itions of the ground water table. The annual ground water table may be calculated with rient accuracy as an arithmetical mean of the weekly measured rates. Twenty sounding ratus were established in the plain of the southeastern catchment area of the March river outh Prerov for the classification of hydrological years. *Subject Headings:* **1. Hydro-eorological instruments 2. Hydrology 3. Ground water table variations.**—*A. V.*

11.4–286 551.579:551.482

Rodier, J., **Résultats obtenus sur les bassins expérimentaux de la France d'Outre-Mer.** sults obtained from experimental basins in French Overseas Territories.] *La Houille uche*, Grenoble, 14(Spec. No. B):952–963, Dec. **1959.** 10 figs., 2 tables. French and lish summaries. **DLC**—Analysis of a number of hydrometeorological observations made bout 25 experimental basins in French Overseas Territories. This study is a contribution ne recognition of the water cycle mechanism for various types of climates and soils. De-otion of the hydrometeorological stations which make measurements of flow, evaporation, tration, runoff and solid transport, etc. is included. On the basis of a large number of vers, the author expresses interesting reflections on the idea of the coefficient of abatement io between maximum at a spot and mean value in the river basin) and of effective rain. mining the observations of runoff, absorption capacity and infiltration has shown the uence of precipitations, plant cover and nature of soil on the flow of floods. A relationship stablished between the decrease of the absorption capacity or the increase of the runoff ficient and the intensity of showers. As regards light or moderate showers, the absorption acity at the beginning of the shower increases with the maximum intensity, up to a certain t reached either by heavy downpour or by showers of very long duration. At the end of vy and very long showers, it has been found that the absorption capacity presents analogous it values (4 to 6 mm/h) for highly diversified soils and climates. Measurements of evapora-n prove that during the rainy season, potential and actual evapotranspirations are very r to each other and in the range of 4 mm/day. The potential evapotranspiration decreases ing the dry season, owing to the fall in temperature. *Subject Headings:* **1. River basin dies 2. Hydrometeorological data 3. French Overseas Territories.**—*A. V.*

11.4–287 551.579.2(234.3)

Poggi, A., **La fusion de la neige et les crues de juin 1957 dans les Alpes françaises.** [The lting of snow and the floods of June 1957 in the French Alps.] *La Houille Blanche*, Paris, (Spec. No. B):934–941, Dec. **1959.** 7 figs., 7 refs. French and English summaries p. 934. **C**—A brief review is given of the theory of snow melt. Expressions are given by which ow melt can be computed in terms of certain factors or physical data. These equations are plied to the June 1957 floods in the Alps. It is shown that mean runoff due to snow melt of the order of 40 to 60 mm and that the maximum for 24 hrs is certainly less than 80 mm, s than 10% being attributable to rainfall and to the effects of melting on the saturation of the ow cover and the ground. *Subject Headings:* **1. Snow melt 2. Snow melt effect on river charge 3. Floods, French Alps (June 1957).**—*Author's abstract.*

11.4–288 551.509.329:551.579.5(282.244.3)

Larrieu, J., **Etude de la nappe phréatique de la basse Durance.** [The water table in the ver Durance basin.] *La Houille Blanche*, Grenoble, 14(Spec. No. B):903–909, Dec. **1959.** igs. French and English summaries p. 903. **DLC**—Statistical study of the variations of the ter table in the lower Durance basin as related to the different physical factors by which may be influenced. The complexity of finding a solution by conventional methods made it cessary to undertake a statistical study based on flow, rainfall and water table observations the basin. The article is divided into three parts: a) statistical study of the mean monthly vel of the water table at several observation points; b) the relation between the level of the ater table and the various hydrometeorological factors of the basin; c) short range forecasting the variations of the level of the water table. The results show the relative independence the water table with respect to river flow and rainfall in the basin, and that there is a closer lationship between the water table and the intensive irrigation carried on in the district.

A method is given for medium range forecasting of the depth of the water table. *Subj Headings:* **1. Ground water movement 2. Water table depth 3. Water table variati forecasting 4. Durance River, France.**—*A. V.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See: **Climat. texts** (Critchfield), 11.4-5; **Climat.** (Schloemer), 11.4–29; **Climat. influences on soil formation** (Kayser), 11.4–48.

CLIMATIC ZONES

See: **Tropical bioclimat.** (Lemaire), 11.4–57.

CLIMATE OF PARTICULAR PLACES

See also: Airport climat., Sudan (Bhalotra), 11.4–34; **Climatic data, Port-aux-Français** (Rodier), 11.4–196; **Snow effects on climate, Canada** (Williams, Gold), 11.4–278.

11.4–289 551.582(966.1) 551.579:628

*Valenciano, Santos and Takasaki, Kiyoshi J., **Military geology of Truk Islands, Caroli Islands: water resources supplement.** Prepared under the direction of the Chief of Engineer U. S. Army, by the Intelligence Div., Office of the Engineer, Hdq. U. S. Army, Pacific, wit personnel of the U. S. Geological Survey, **1959.** 81 p. Loose-leaf. 8 maps (fold. in pocket On cover-title: Engineer Intelligence Dossier, Strategic Study Carolines, Subfile 19, Analys of the Natural Environment. **DWB** (559.661 U581mi Suppl.)—After a brief discussion of th location, topography, climate, rain gages, etc. on Truk, the surface water supply, ground wate public and native water supplies are discussed and then the water resources of each of 2 individual islands are discussed and illustrated. Tables give monthly precipitation, runo and water loss for 1956 and 1957 climatic year for 2 rivers. *Subject Headings:* **1. Water re sources surveys 2. Climate of Truk 3. Truk, Caroline Islands. I. U. S. Army. Forces i the Far East II. U. S. Geological Survey.**—*M. R.*

11.4–290 551.582.2(729/882

*Campan, G., **Note sur la climatologie des Antilles et de la Guyane Française.** [Not on the climatology of the Antilles and French Guiana.] *France. Météorologie National Monographies*, No. 15, **1959.** 26 p. 3 figs., tables, 7 refs. **DWB**—This monograph give climatological data (precipitation, humidity, sunshine, evaporation and wind) for Martiniqu Guadeloupe and French Guiana. The rainfall data are more numerous and more detailed A chart of mean annual isohyets is drawn for each of these regions and tables indicate th average monthly and annual amounts of rainfall for a certain number of pluviometric stations The mean annual amount of rain varies greatly according to exposure and altitude. I Martinique, the annual depth of rainfall varies from 1.25 m to more than 5 m; in Frenc Guiana, from 2 m to 4.5 m and in Guadeloupe from 1 m to 10 m. The rainfall regime consist of a dry season and a rainy one. In Martinique and Guadeloupe the dry season has a duratio of five months, from December to April, and is the most marked from February to April. quarter of the annual amount of rainfall is collected during this dry season. In French Guiana the dry season lasts for five months, from July to November, during which less than 20% o the annual amount of rainfall is gathered. The author gives information on the variatio of the water depth with altitude and develops a classification of the various types of rainfall Pt. IV deals with tropical cyclones in French Guiana. A short historical account is given o the cyclones which crossed these regions, and more particularly on cyclone "Janet" whic occurred in the Caribbean Sea during September 1955. *Subject Headings:* **1. Climatic data fo the Antilles 2. Climatic data for French Guiana 3. Antilles 4. French Guiana.**—*A. V.*

11.4–291 551.582.2(747) 551.584.5(747)
U. S. Weather Bureau, **Climatic guide for New York City, New York and nearby areas.** *Climatography of the U. S.*, No. 40-26, **1959.** 61 p. 15 figs., 42 tables, map. Price: $0.40 Govt. Print. Office. **DLC** (Govt. Publ. R.R.), **DWB** (M82.2/73 U587cL)—A nice ilation of all of the basic climatic data for 13 stations in the New York City area. Ex- ve tables and graphs, frequency diagrams, etc. (and some description) are presented for f the temperature parameters (including degree days), precipitation, snow, wind, relative idity, wet bulb temperature, discomfort index, cooling degree days, dew point, ceiling, ility (and combination of both), pressure and pressure change, sunrise and sunset, maxi- n wind speeds, solar radiation (Langleys) on a horizontal surface and daily, monthly and tal normals and accumulated degree days. *Subject Headings:* **1. Climatic data for New City 2. New York City.**—*M.R.*

CLIMATIC CHANGES

See also: **Temp. trends, Minnesota** (Baker), 11.4–250; **Climatic variations, Eismitte** (Bader), 11.4–275; **Climatic change influence on living beings** (Cailleux), 11.4–299.

11.4–292 551.583.3:551.324.63
†Galon, Rajmund, **The problem of the last glaciation in Poland.** *Przegląd Geograficzny*, -saw, 28(Supp.):75–93, pub. **1956.** 2 figs., 46 refs. **DWB**—The last glaciation (Scan- avian Ice Sheet), its southern limit, its retreat after the maximum, and geomorphologic climatic changes resulting or attending the deglaciation are described and shown on detailed s for various stages (before and after the maximum). Small advances and retreats are sidered. A large color map shows the limits of the main phase and of small phases over all Poland. *Subject Headings:* **1. Glaciation 2. Glacial climates 3. Poland.**—*M.R.*

11.4–293 551.583.3:551.324.63
†Hofmann, Walther (*Munich*), **Der Vortoss des Nisqually-Gletschers am Mt. Rainier, A, von 1952 bis 1956.** [Progression of the Nisqually Glacier on Mt. Rainier, U. S. from 2 to 1956.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, Innsbruck, 4(1/2):47–60, 8. 6 figs. (incl. photos), table, 18 refs. **DWB, DLC**—Photogrammetric measurements as ducted in 1952 and again in 1956 permit exact determination of the changes within this iod which show: (1) the linear advance = 300 m in the horizontal plane; (2) areal accumula- n = 12.57 Ha (or 29.060 acres) corresponding to 2.62%; annual mean = 3.14 Ha or 0.66%; volume accumulation = 35,544,000 m^3 ice, annual mean 8886 $m^3 \pm 2\%$ accuracy; (4) ve- ity (measured in the center) increased from 90 m (1952) to 126 m a year. The advance eeds the assumed equilibrium by 6%. LAGALLY's depth formula compared with practical asurements was negative, 1:1/4. Movement is rather of the block type than laminar. anges may influence climate locally. The results are tabulated and graphed. *Subject adings:* **1. Glacier advances 2. Nisqually Glacier, Mt. Rainier.**—*W.N.*

MICROCLIMATOLOGY

See also: **Slope microclimat., Ötztal Alps** (Turner), 11.4–52; **Climatic guide, N. Y. City,** 11.4–291; **Forest microclimat.** (Pruitt), 11.4–298.

11.4–294 551.584.3:631.6(675)
*Van Parys, A., **Les cultures en marais drainés en Ituri.** [Cultivation in the drained arshes in Ituri.] *Institut National pour l'Étude Agronomique du Congo Belge, Brussels, ulletin d'Information de l'INEAC*, 8(6):375–390, **1959.** 3 figs., 10 tables, ref. **DWB, DLC**— he first chapter of this study, relating to cultivation in the drained marshes of Ituri (Belgian ongo) is devoted to microclimate of marshes. The comparison of the climatic conditions the tablelands and those prevailing in the marshes of High-Ituri (rainfall, saturation deficit, aporation, temperature, radiation) shows that in the marshes: a) owing to the lack of pre- pitation, the water regime of the soil must be regulated through a drainage-irrigation system;) the values of saturation deficit and radiation are comparable with those of the tableland;

c) diurnal temperature is distinctly higher, but nocturnal frost is more to be feared. N the various types of marshes, the farming methods and the species under cultivation discussed. If consideration is given to the hydrous equilibrium of the soil, these marshes particularly well suited to the cultivation of species with short vegetation periods, particul to corn. *Subject Headings:* **1. Marsh microclimates 2. Irrigation 3. Tilling meth 4. Ituri, Belgian Congo.**—*A.V.*

11.4 295 551.584.34:551.524.4(9

Hamilton, R. A., **The temperature gradient in the air above an ice sheet.** *Meteorolog Magazine*, London, 88(1040):38–43, Feb. **1959.** fig., table, 5 refs. **DWB, DLC**—Temperat gradient measurements made with a theodolite at the station "Northice," Greenland (78° 38°W, 2,341 m.a.s.) during the summer 1953 are presented and discussed. The temperat gradient dT/dZ is shown in a mean curve for its diurnal variation in normal fair weather a the differences $\Delta dT/dZ$ from each point plotted are tabulated along with other meteorologi data, from which it is indicated that origin of air mass, rather than screen temperature a wind speed, determines the value of departure of the temperature gradient from the me value for the time of day. A "Shimmer Code" is introduced to correlate degree of shimm from 0–6 (0 = no shimmer, 6 = severe shimmer) with the temperature gradient. The correlati coefficient of 0.56 is significant considering the 73 cases observed. Shimmering, presumab due to uneven air stratification close to the ground, increases with intensity of inversi A useful equation is also given and demonstrates that convex curvatures of the refracted r occurs near ground under strong radiation. *Subject Headings:* **1. Temperature gradient ov Arctic ice 2. Greenland.**—*W.N.*

CLIMATIC CLASSIFICATION

See: **Climat. classification oriented toward human biomet.** (Berg), 11.4–56.

BIOCLIMATOLOGY

See also: **Transpiration and crop yield** (deWit), 11.4–37; **Viticulture** (Schellenberg), 11.4–45; **Weather effects on rice crop** (Yanagiya), 11.4–46; **Radiation climatology** (Turner), 11.4–52; **Climat. classification oriented toward human biomet.** (Berg), 11.4–56; **Physiological climat.** (Lemaire), 11.4–57.

11.4–296 551.586:06.045(21

Nicolas, J. P. (*Dakar*), **Proposition pour une Commission de Bioclimatologie Intertropical** [Proposal for a Commission on Intertropical Bioclimatology.] *International Journal Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 7, Misc. Bioclimatological Data), **1955** 1 p. **DWB**—The program of the proposed Commission for Intertropical Bioclimatology shoul be as follows: definition of intertropical climates (equatorial, subequatorial, etc.); determinatio of the characteristics of local climates, in particular the geographic features of the intertropic stations; study of intertropical meso- and microclimates; influence of intertropical climate upon distribution of human population; study of physiological processes in intertropica climates, distinguishing between dry warm and humid warm climates, etc. *Subject Heading* **1. Commission for Intertropical Bioclimatology.**—*I.L.D.*

11.4–297 551.586:551.524:634.5

Bolhuis, G. G. and De Groot, W., **Observations on the effect of varying temperatures o the flowering and fruit set in three varieties of groundnut.** *Netherlands Journal of Agricultura Science*, Wageningen, 7(4):317–326, Nov. **1959.** 8 figs., 3 tables, 18 refs. **DA**—An investiga tion was made of the effect of temperature on the flowering and development of three groundnu varieties from Indonesia (6°–7° lat. S), Mallorca (39° lat. N) and the Ukraine (51° lat. N respectively. The authors describe the experimental material used, the techniques an methods of the experiments. No great differences in reaction to temperature were foun between the varieties. Generally speaking, a temperature of 33°C was found to be too hig for a normal development of the groundnut. On the other hand at temperatures below 24°

th was always greatly retarded; there was no flowering. Between these temperatures optimum was found to lie between 27° and 30°C with an Indonesian variety, at 27°C a Mallorcan variety and even somewhat below this temperature with a Ukrainian variety. eater tolerance to different temperatures was found as the latitude increased from which varieties originated. *Subject Headings:* **1. Agricultural meteorology 2. Temperature ts on groundnuts.**—*A. V.*

11.4–298 551.586:551.584.41:599.3

Pruitt, William O., Jr., **Observations on the bioclimate of some taiga mammals.** *Arctic*, treal, 10(3):131-138, **1957.** 3 figs., table, 9 refs. **DLC**—During the winter and spring 954–55 and 1955–56, the author investigated the microclimate of a sample area situated he Alaskan taiga which consisted of a moss covered forest floor, the habitat mainly of backed voles, shrews, weasels and red squirrels. Eighteen thermistors were inserted into mossy floor at 9, 6 and 3 in. below surface and at zero inches among the tops of the moss ts. Air temperature was measured at 6 ft above the ground. The snow cover, and soil air temperature during the snowfall and snow periods are discussed, with the aid of nuical data and a climograph of the subnivean environment for the winters of 1954–55 and 5–56 is presented. "The subnivean environment is characterized by temperatures with a ow range and rather gentle fluctuation, silence, darkness and saturated atmosphere." subnivean environment is characterized by air that varies from saturated to very dry, wind and stillness, and by cyclic light and darkness. During the winter of 1955–56, for mple, the absolute minimum at all depths was +5°F at the moss surface, +6°F at the 3 in el, +15°F at the 6 in. level and +23°F at the 9 in. level. *Subject Headings:* **1. Forest roclimatology 2. Bioclimates of taiga mammals 3. Alaska.**—*I.L.D.*

11.4–299 551.586:572.021 551.583

Cailleux, André, **Crises climatiques et développement des êtres vivants.** [Climatic nges and evolution of living beings.] *Revue Générale des Sciences Pures et Appliquées*, ris, 66(3/4):63–66, March/April **1959.** 7 refs. **DLC**—The author, who is a geographer-logist, compares the conclusions of his investigations and ideas with those expressed by the eontologists G. and H. TERMIER in an article published in this periodical [65(3/4):83–91, rch-April, **1958**] on the subject of the influence of climates on the evolution of living beings. nilar conclusions resulted from the research of paleontologists and of geographers and logists: harmful action of oceanic salinity on living beings increases particularly for marine e during glacial advance, and harmful influence of aridity increases for terrestrial life during cial recession. *Subject Headings:* **1. Paleontology 2. Climatic changes 3. Climatic change fluences on living beings.**—*A. V.*

11.4–300 551.586:591.1.05:581.13

Pichotka, J. (*Freiburg*), **Über das Wesen biologischer Reaktionen auf meteorologische nflüsse.** [Nature of biological reactions to meteorological influences.] *Annalen der eteorologie, Medizin-Meteorologische Hefte*, No. 13:38–48, **1958.** 9 figs., refs. **DWB**—The ructure of the relationship between organisms and environment is discussed on the basis of e specific example of the influence of temperature upon the metabolic rate of plants and imals (cold and warm blooded). The metabolism of potato tissue at temperatures of 15° d 30°C shows that initial rise is more rapid, the maximum values are greater, and the rate decline is greater at high, rather than low, environmental temperatures. At the constant hase of different temperatures the metabolic rate varied between 10% and 20%, that is a Q_{10} 1.1 and 1.2 for temperature differences of 10 and 15°C, instead of 2 as expected on the basis the van't Hoff scale. Experimental evidence is cited indicating that the metabolism does ot show a simple dependence upon temperature. This plant tissue shows an adaptation to mperature levels—a phenomenon also found in cold blooded animals. A similar response of lant tissue to the environment is the response of metabolic rate to variation in O_2 tension at onstant temperature. In the case of warm blooded animals, which regulate their body mperatures, there is also evident an influence of environmental temperature upon body temerature; they vary in the same direction, all other factors being constant. In the comfort one both the temperatures of the extremities and the rectal temperature vary 5–8°C and 0.5°C

respectively, with outside temperature. But stability requirements necessitate that bl temperature, metabolism and atmospheric temperature vary in opposite directions. relationship between body temperature and metabolic rate at different atmospheric temp tures is discussed. *Subject Headings:* **1. Animal metabolism 2. Plant metabolism 3. Te perature effects on metabolism.**—*I.L.D.*

UPPER AIR CLIMATOLOGY

See: **Aeronaut. met., Kemi Airport, Finland,** (Venho), 11.4–33; **Synoptic aerology** (Borchardt), 11.4–191.

ENVIRONMENTAL INFLUENCES

See: **Forest climates** (Collins), 11.4–50; **Afforestation influences on water balance** (Leyton, Carlisle), 11.4–53; **Forest hydrology, Freiburg Canton** (Nägeli), 11.4–54; **Rain forests** (Weck), 11.4–55; **Orographic effects on troughs and ridges** (Yang et al.), 238.

MISCELLANEOUS

See: **Sec. C2,** p. 321.

VISIBILITY

See: **Ceiling and visibility data** (Guss), 11.4–32; **Airport visibility** (Serpolay), 11.4–216.

OPTICAL PHENOMENA

See also: **Atmos. optics conf.,** 11.4–28; **Twilight phenomena** (Barbier), 11.4–129; **Emission spectra of artificial sodium clouds** (Vassy, Vassy), 11.4–248.

11.4–301 551.593.63:551.574

Visser, S. W., **Halo's zonder kleine kring.** [Halos without a small ring.] *Hemel e Dampkring,* The Hague, 57(11):260–263, Nov. **1959.** fig., 3 tables, 3 refs. **DWB, DLC**— During the period 1918–1957 in the Netherlands, 536 days without a small ring were observe out of 9082 halo-days. A study of the occurrence of all the halo-days and halo-days witho a small ring during the several months of the year reveals that the period October–March i much more favorable for halos without a small ring than the summer months. Also the annua course of six main forms of the halo family which may occur without a small ring (tangent arcs mock suns, parhelic circle, large ring, circumzenithal arc, pillar) is investigated. Consideratio of the nature of these forms leads to the conclusion that halos without a small ring occur in steady atmosphere at temperatures between −15° and −20°C, in which plate-crystals pre dominate. *Subject Headings:* **1. Halos 2. Ice crystals.**—*A.V.*

ELECTRICAL PHENOMENA

See also: **Satellite obs. of ionization** (Nicolet), 11.4–150; **Dust in electric fields** (Lot), 11.4–220; **Electrification effects on droplets** (Twomey), 11.4–267; *also* **Sec. D2,** p. 526.

11.4–302 551.594.12:629.1

Corbillon, Pierre, **Charges statiques et décharges électrostatiques sur les avions.** [Stati charges and electrostatic discharges on airplanes.] *France. Secrétariat Général à l'Aviatio Civile et Commerciale, Bulletin de Liaison et de Documentation,* No. 95:35–37, March 15, **1958** 3 refs. **DLC**—Rapid survey of the phenomena relating to atmospheric electrostatic discharges taking into account the present knowledge of the subject. The author mentions the con sequences of electrostatic discharges as concerns material and staff, and the importance of th

n of static charges and electrostatic discharges on airplanes. Protective measures to t against electric phenomena resulting from the charges in the atmosphere are recommded for cases of static charges and electrostatic discharges. *Subject Headings:* **1. Ionization ts on airplanes 2. Protection against electrical phenomena 3. Measures of protection.** *V.*

11.4–303 551.594.13:551.501.7

Anderson, Robert V. (*U. S. Naval Res. Lab., Wash., D. C.*) and Serby, G. P. (*Natl. Aeroics & Space Admin.*), **Airborne measurement of atmospheric conductivity in fifteen-day-thermonuclear debris.** *Journal of Geophysical Research*, Wash., D. C., 65(1):223–226, **1960.** 4 figs., 10 refs., 6 eqs. **DWB, DLC**—Total atmospheric conductivity was measured flight through fifteen-day-old thermonuclear debris. Significant increases in conductivity e noted within the debris at altitudes of 17,000 and 5000 ft. The relative increases at the altitudes are found to be in good agreement with values calculated from ion-equilibrium ditions. *Subject Headings:* **1. Atmospheric conductivity measurement techniques 2. Thermuclear debris effects on atmospheric conductivity.**—*Authors' abstract.*

ACOUSTICAL PHENOMENA

11.4–304 551.596.1:534.2

Szendrei, M. E. (*Natl. Phy. Res. Lab., Council for Scien. & Indus. Res., Pretoria, So. Africa*) **experimental investigation of the propagation of a sonic pulse along the surface of a semi-nite medium.** *Geofisica Pura e Applicata*, Milan, 43:36–44, May/Aug. **1959.** 7 figs., ables, 7 refs., 7 eqs. English summary p. 36. **DWB, DLC**—The wave form of a sonic pulse ng the surface of a semi-infinite medium is investigated for short distances from the source. e velocities of the various modes are compared and used to deduce the elastic constants of e medium. The breadth of the Rayleigh wavelets is used to verify the wavelet theory and duce the law of absorption of the medium. Direct attenuation measurements are somewhat ttered and do not agree exactly with wavelet breadth results. *Subject Heading:* **1. Acoustical opagation.**—*Author's abstract.*

PART II. RECENT LITERATURE ON PHYSICS OF TH IONOSPHERE

Compiled by: Geza Thuronyi

INTRODUCTORY REMARKS

The increase in the number of possible practical applications of knowledge concerning t ionosphere, and the resulting extensive participation of research establishments in ionospheric stud has led to an unprecedented amount of literature on ionospheric physics and radio propagati In the past year the limited publishing capabilities of *Meteorological Abstracts* did not allow f coverage of ionospheric literature without slighting other, equally important, fields of meteorolo Consequently a large number of abstracts, available for publication, has accumulated. This backl will be published in three parts. The first part, containing material dealing with the **Physics of t ionosphere,** is presented in this issue; material applying primarily to radio propagation resear will be included in the following (May) issue; while the third part, a supplement to the other tw is planned for the June issue. Obviously, it is not possible to make a clear-cut division according the two (physics and propagation) aspects, as many, if not most, papers deal with both. It is hope however, that the subject outlines preceding each compilation, and the cumulative outline in the la issue, will help locate the material of interest to the user and thereby overcome the difficulties resulti from this arrangement into three groups.

In using this material it should be borne in mind that it is not a systematic compilation, a explained above. Many hundreds of additional abstracts on the subject are to be found in pa issues of *Meteorological Abstracts* (including a bibliography on **Ionospheric propagation** in Vol. No. 4, April **1955**) and it is hoped that a complete coverage of the current literature will be possibl in the near future. In the meantime the approximately 500 items to be contained in this and th following two issues are presented as a partial contribution toward such coverage.

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11D–1 551.510.535:550.388:551.

Akasofu, Syun-ichi (*Tohoku Univ., Geophysical Inst.*), **Geomagnetic control to the diur variation of the F2 layer on the temperate latitude.** *Tôhoku Univ. Science Reports, 5th Ser., C physics*, 7(2):45–50, Nov. **1955.** 2 figs., table, 12 refs., 5 eqs. **DWB, DLC**—The longitude eff first shown by APPLETON is examined in some detail. It is shown that the deformation of ionization in the F2 region has a large diurnal component. The amplitude of this component sho a marked seasonal variation, being largest in summer. This evidence suggests that the so-cal anomalous daily variation of the F2 layer is caused by the ionic motion owing to the vertical air fl *Subject Headings:* **1. Diurnal ionospheric variations 2. Geomagnetic variations 3. Ionosphe vertical currents 4. Magnetic effects on ionosphere.**—*Author's abstract.*

11D–2 551.510.535:523.59:538.

Akasofu, Syun-ichi, **Magneto-hydrodynamic waves in the ionosphere.** *Journal of Atmosphe and Terrestrial Physics*, London, 15(1/2):156–160, Sept. **1959.** 2 figs., 12 refs., 6 eqs. **DLC**— study is made of the magneto-hydrodynamic waves in the ionosphere and the outer atmosphe The dispersion relations of Alfvén waves are obtained and it is shown that various types of g magnetic micropulsations and ionospheric noises appear in the wide range from audio- to very lo frequency. The Alfvén waves with finite amplitude are also studied. It is suggested that t retarded sound-type shock wave may be identified with the descending "cusps" on h′-f curve ionogram. *Subject Headings:* **1. Magneto-hydrodynamic waves 2. Ionospheric waves.**—*Autho abstract.* Ⓢ

11D–3 551.508.96:551.510.53

Albrecht, Hans J. (*Schramberg-Sulgen*), **Technische Gesichtspunkte bei Ionosphärendate auswertung und modernem Ionosondenaufbau.** [Technical approach to ionospheric data evaluati and modern ion-sonde construction.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A* Vienna, 11(3):383–391, **1959.** 3 figs., 10 refs., eqs. German, English and French summaries p. 38 **DWB, DLC**—Using his previous investigations on instrument effects in ionosphere measurements. th author develops a method of ionospheric data analysis. In this connection the modern equipmer of ionosphere stations is discussed. *Subject Headings:* **1. Ionospheric data analysis 2. Ionospher sondes.**—*Author's summary.* Ⓢ

11D–4 551.510.53

Appleton, Sir Edward V., **The normal E region of the ionosphere.** *Institute of Radio Engineers N. Y., Proceedings*, 47(2):155–159, Feb. **1959.** 5 figs., table, 11 refs., 15 eqs. **DLC**—The E laye is situated in the middle ionosphere; its lower boundary is at a level of about 100 km when the su is vertical. Its maximum ionization density is of the order of 10^5 electrons per cc but this varies b about 50 to 60% in the course of the sunspot cycle. The production of ionization in the E layer i due to solar photons, most probably of X-ray character. The disappearance of electrons in th E layer is by way of dissociative recombination between electrons and positive molecular ion E-layer morphology is influenced to a slight extent by horizontal currents flowing in it across th horizontal geomagnetic field; in other words, the E layer is a motor. It is generally considered tha such currents are produced by dynamo action in the E layer due mainly to a diurnal horizontal tida motion of the conducting medium across the earth's vertical magnetic force. The rough parallelism of the intensity of these horizontal currents with E-layer conductivity during the sunspot cycl suggests the simple result that the diurnal horizontal motion itself does not vary substantially wit solar activity. *Subject Heading:* **1. E layer.**—*Author's summary.* Ⓢ

11D–5 551.510.535:550.38

Argence, Émile and Mayot, Marcel, **Détermination de l'altitude et de la demi-épaisseur d'un couche ionosphérique régulière compte tenu de l'action du champ magnétique terrestre (rayon ordinaire et extraordinaire).** [Determination of the height and half-thickness of a regular ionospheri layer, considering the effect of the geomagnetic field (ordinary and extraordinary rays).] *Académi des Sciences, Paris, Comptes Rendus*, 238(17):1721–1723, April 26, **1954.** 2 figs., ref., 4 eqs. **DLC**— A formula is developed for calculating height and thickness of ionospheric layers. A discrepancy between calculated and measured values of F2 layer thickness at Freiburg, Germany (March 1953 is attributed to the existence of an attenuating layer with low critical frequency, not appearing o the ionogram used. *Subject Headings:* **1. Ionospheric heights 2. F2 layer thickness 3. Magneti effects on ionosphere 4. Freiburg, Germany.**—*G.T.*

11D–6 551.510.535:551.594.12:551.521.6

†Bailey, D. K., **Abnormal ionization in the lower ionosphere associated with cosmic-ray flu enhancements.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):255–266, Feb. **1959.** 9 figs, 3 tables, 28 refs., 14 eqs. **DLC**—Abnormal ionization in the lower ionosphere associated with cosmi

flux enhancements is discussed mostly in terms of the great solar event of Feb. 23, 1956. Two ...s of abnormality were recognized: early effects observable in the dark hemisphere at the time ...e sudden cosmic ray enhancement, and late effects which began gradually and reached a maxi... a few hours after the cosmic ray enhancement. The late effects died away over a period of ...al days in geomagnetic latitudes above 70°, but more rapidly in lower latitudes. Both effects ...more intense in higher geomagnetic latitudes. Early effects, though much the less intense of the ...appear to have been observable in lower geomagnetic latitudes than the late effects. The early ...ts are explained as a consequence of a plausible difference in composition between streams of ...particles of cosmic-ray energies, and ordinary cosmic rays. The late effects are explained in ...s of ionization produced in the lower ionosphere (the range of height from 30 to 110 km is studied) ...he passage or stopping of solar particles—mostly protons. Such particles are shown, like the ...energetic solar cosmic rays, to be arriving essentially isotropically after the maximum effects ...r. A plausible extension of the observed magnetic-rigidity spectrum of the solar cosmic rays ...nward in rigidity by about a power of 19 would provide the protons necessary to account for the ...rvations. The absence of auroral and significant magnetic activity accompanying the abnormal ...ization is consistent with the explanations offered. Moreover, certain more recent high-latitude ...orption events, unaccompanied by ground-level cosmic ray flux enhancements, are explicable in ...lar terms. An interesting by-product of the investigation is a provisional evaluation not only ...he coefficient of collisional detachment of electrons from negative ions, probably mostly O_2^-, ...also of the negative-ion-to-electron ratio and the effective recombination coefficient at night ...ween 30 and 110 km. *Subject Headings:* **1. Ionospheric ionization 2. Cosmic ray effects on ...osphere.**—*Author's summary.* Ⓢ

11D–7 551.510.535:551.594.12

...Bailey, V. A. *(Univ. Sydney, Sydney, Australia)*. **Some possible effects caused by strong gyro-...ves in the ionosphere, Pt. 1.** *Journal of Atmospheric and Terrestrial Physics*, New York, 14(3,4): ...-324. June 1959. 3 tables, 28 refs., numerous eqs. **DWB, DLC**—The possible increases of ...ision frequencies ν and electron densities n caused by a powerful extraordinary circular gyro-wave ...he nocturnal lower E region and in the daytime D region are investigated on the basis of available ...oratory experiments on electrons in air and data concerning these regions. The resultant effects ...such increases on this wave and on other waves are then examined. It is found that some of ...se effects are remarkable in magnitude or in kind. Thus, notable self-distortion of gyro-waves ...l extremely large wave-interaction can be caused by such an extraordinary wave when the reduced ...ivalent electric force $Z\,p$ which it produces in the nocturnal lower E region has the value 2.5 V/cm ... mm Hg measured at room temperature. Other possible detectable effects which may be caused ...night when $Z\,p$ has a value between 2.5 and 8 include changes in the airglow and in parts of some ...ils of meteors and fast particles of solar or cosmic origin, changes in radar echoes from such trails ...l transient changes in the local magnetic elements. *Subject Headings:* **1. Ionospheric gyro-waves ...Ionospheric electron density.**—*Author's abstract.* Ⓢ

11D–8 551.510.535:523.7

Bandyopadhyay, P. *(Univ. of Calcutta, India)*. **The early morning *E*2-layer and some evidence ...pre-sunrise *F*-layer "splitting."** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1,2):84–..., Oct. 1959. 6 figs., 12 refs. **DWB, DLC**—Two early morning phenomena, one relating to the ... layer cusps and ridges and the other to the F layer traces as observed in the $h'-f$ records made ... Haringhata (Calcutta), are described and discussed. The early morning E2 layer cusps and ...lges are found to be a regular sunrise feature of the ionograms. They show marked seasonal ...riation of character and frequency of occurrence and are most prominent in winter. The early ...orning F layer records show, also in winter, a peculiar kind of "splitting" which is quite distinct ...om regular F1, F2 bifurcation. This F layer "splitting" and its possible bearing on the E layer ...enomena described above are discussed. Representative ionograms of the two phenomena are ...ven. *Subject Headings:* **1. F layer "splitting" 2. E2 layer 3. Sunrise effect on ionosphere.**—...*uthor's abstract.* Ⓢ

11D–9 551.510.535:551.543.1:551.590.22

Baral, S. S. *(Dept. of Physics and Communication, Bengal Engineering College, Howrah)*. **Lunar ...dal variations in the F2 region of ionosphere.** *Journal of Technology*, Calcutta, 1(2):175–177, ...ec. 1956. 3 tables, 4 refs. **DWB**—Ionospheric data for Calcutta for January 1947–January 1953 ...ere used for study of lunar tidal variations in the ionosphere in the sub-tropics. The values have ...en computed from quiet day values of foF2 and hpF2 using the CHAPMAN-MILLER fixed age method. ...ourly foF2 data and 3-hour hoF2 data were analyzed using a phase correction because of use of ...reenwich time of lunar transit. Comparison is made with other stations and values agree with ...eoretical values for similar latitudes using Martyn's theory. Velocity of lunar tidal drift is

calculated at 1.25 km/hr. Solar variations (semidiurnal) are also calculated and tabulated. *Subje*
Headings: **1. Lunar diurnal ionospheric tides 2. F2 layer.**—*M.R.*

11D–10 551.510.535:551.515.2

Bauer, Siegfried J. (*U. S. Army Signal Engin. Labs., Fort Monmouth, N. J.*), **An appare**
ionospheric response to the passage of hurricanes. *Journal of Geophysical Research*, Wash., D. C
63(1):265–269, March **1958.** 5 figs., 5 foot-refs. **DLC**—During 1954 and 1955 four hurrican
came close to Washington, D. C. Data on F2 layer critical frequency, geomagnetic index, surfac
pressure and 500 mb height obtained during the passage of these hurricanes are compared graphicall
The curves show a close agreement between departure from monthly mean *fo*F2 and pressur
especially on days close to the passage of hurricanes. Critical frequency rises with falling pressur
reaching its maximum about the time of min. pressure, when the hurricane passes closest to th
station. *Subject Heading:* **1. Hurricane effects on ionosphere.**—*G.T.*

11D–11 551.510.535:551.594.1

Becker, Walter (*Max-Planck-Inst., Hannover, Germany*), **Sporadic ionization of the E-regio**
of the ionosphere above Lindau/Harz during the past year. *AGARDograph*, Paris, No. 34:59–6
Sept. **1958.** 3 figs., 5 tables. **DWB** (629.1323 N864a)—The concept "Sporadic Ionization of th
E-Region" covers all ionization steps between 60 and 190 km height that are sporadic in time an
hence not due to normal ultraviolet solar irradiation. A classification of these ionization steps i
adopted. It agrees with the proposals of the World-Wide Soundings Committee as far as highl
intense echo traces are concerned. A statistical investigation of the characteristics of these trace
is presented. The characteristics were deduced from multi-frequency records taken at hourly in
tervals from July 1, 1957 to June 1, 1958. A well-pronounced daily-seasonal dependence of th
maximum frequency of the most significant Es trace on each record, with a clear maximum at noo
and summer, could be shown. The same relationship was found for secondary Es traces which wer
not mainly continuous. No distinct height ranges for the different Es types or intense Es ionizatio
steps, nor a daily-seasonal dependence of the heights could be found. Homogeneous, layerlike
reflections were observed mostly about noon. Each second record showed such intense Es reflections
Nothing new about the occurrence frequency of weak meteoric traces could be found. Low leve
ionization steps below 85 km height only observed during daytime, with a winter maximum (rate o
winter observations: 50%). It is assumed that different ionization mechanisms must be responsibl
for the observed sporadic ionization of the E region. *Subject Headings:* **1. Sporadic E layer (Es)s**
ionization 2. Lindau/Harz, Germany.—*Author's abstract.*

11D–12 551.510.535:551.593.7

Becker, W.; Ferraro, A. J. and Gibbons, J. J., **Coupling and polarization computations approxi**
mated by a single discontinuity in the medium. Pennsylvania, State Univ., Contract AF 19(604)-
1304, Scientific Report No. 104, July 1, **1958.** 33 p. 13 figs., tables, 11 refs., eqs. **DWB** (M10.535
P415i)—Following an initial suggestion by one of the authors that coupling can be approximated by
considering slabs of uniform electron density around the coupling level, the problem has been further
simplified by employing a step discontinuity at the N_c level. This gives a quick approximate method
for computing the effect of coupling. Coupling is concentrated by appropriately deforming the
N-h and ν-h curves in a region around the level of N_c; the deformation is done in such a manner that
the gradient of electron density and collision frequency is zero as one approaches the level of N_c from
either below or above. At this level there is, then, a step discontinuity in the N and ν profiles.
W.K.B. solutions are used as the wave functions and the coupling between the ordinary and extra-
ordinary modes is taken into account by solving a boundary value problem at the discontinuity.
Formulas have been developed for the polarization of the upgoing back scattered wave and the
downgoing forward scattered wave. Results are compared with those obtained by presumably
more accurate methods PARKINSON (1955). Even near critical coupling, the approximation gives
fairly satisfactory results for the polarization of the "main" echo at 150 kc/s. *Subject Headings:*
1. Ionospheric coupling 2. Ionospheric polarization.—*Authors' abstract.*

11D–13 551.510.535:550.388.2

Becker, W., **Das Vergleichsverfahren der Station Lindau/Harz zur Bestimmung der wahren**
Verteilung der Elektronendichte in der Ionosphäre. [Comparison method of the Lindau/Harz
station for determining the real distribution of electron density in the ionosphere.] *Archiv der*
Elektrischen Übertragung, Stuttgart, 13(2):49–57, Feb. **1959.** 8 figs., 2 tables, 5 refs., 25 eqs. English
summary p. 49. **DLC**—The principle of the method was described by the author in an earlier paper.
In the meantime the method was considerably expanded, for now all calculated and observed ordinary
echo sounding records of variable frequency are compared. The comparison of the extraordinary
sounding traces has also been included. The basic advantage of the last-named comparison is the
fact that the extraordinary sounding trace is fully within the measuring range of the customary

ospheric probes (1 to 16 Mc/s), while formerly assumptions of some kind had to be made concern- the lacking ordinary trace between 0 and 1 Mc/s. Greater ease in height determination also ults from a comparison of the extraordinary traces. To allow the method to be adopted by other ions having a similar magnetic inclination (67°6′), the mathematical fundamentals, the required es, and a description of the evaluating device are given. *Subject Headings:* **1. Ionospheric tron density distribution 2. Ionospheric electron density measurement techniques 3. Lindau/ z, Germany.**—*Author's abstract.* Ⓢ

11D–14 551.510.535:551.594.12 550.388.2

Becker, W., **Die allgemeinen Verfahren der Station Lindau/Harz zur Bestimmung der wahren teilung der Elektronendichte in der Ionosphäre.** [The general methods of the Lindau/Harz ion for determining the true electron density distribution in the ionosphere.] *Archiv der Elek- chen Übertragung*, Stuttgart, 13(9):373–382, Sept. **1959.** 9 figs., 11 refs., 27 eqs. German and glish summaries p. 373. **DLC**—Three nonelectronic methods are described. The "general thod" is free of all restrictions. It is based on the fact that with a magnetic inclination of 67° or re a purely longitudinal propagation can be assumed for the extraordinary component so that Ryd- k's inversion for purely longitudinal propagation can be applied. The two correction methods in- ded for a reduction of the ordinary and extraordinary sounding traces, respectively, depend for ir accuracy somewhat on the degree to which the observed shape of the layer agrees with the profile a reference layer to be determined previously with the author's comparison method. The two thods determine the corrections to be applied to this reference profile for obtaining the unknown file. In their practical realization all three methods make use of the slide rule principle. A 10- nt $N(h)$ analysis takes 2 hrs for the general method and 1.5 hrs for each of the correction methods. e accuracy of all three methods is inherently greater than the practical measuring accuracy. eir advantage over the present electronic methods is due to the fact that they also take into count an extrapolation of the sounding traces down to the abscissa origo $f=0$ and $f=fH$, respect- ly, with the dependability of the comparison method. *Subject Headings:* **1. Ionospheric electron nsity distribution 2. Ionospheric radio wave propagation 3. Ionospheric electron density asurement techniques.**—*Author's abstract.* Ⓢ

11D–15 551.501.7:551.510.535

Becker, W., **New methods and some results concerning true ionospheric height calculations.** *urnal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):67–83, Oct. **1959.** 20 figs., 2 tables, refs., 7 eqs. **DWB, DLC**—The methods can be listed as follows: (a) Optical-graphical comparison thod, comparing, for certain layer-types, calculated ordinary and extraordinary $h'(f)$-traces with served $h'(f)$-records. It is possible to determine the best fitting layer-types and its parameters thin 8 min. (b) General method, applicable to any monotonic $h'(f)$-trace. This method is based Rydbeck's solution of the respective integral equation. A 10 point $h'(f)$-reduction according to is method takes 2 hr. (c) Correction method, combining the methods (a) and (b). Thus the ne necessary for a 10 point $h'(f)$-reduction can be reduced to 5/4 hr. The following results are ported: (a) Good agreement between actual layer shape and parabolic $N(h)$-distribution for the disturbed night-time F layer on 8 Aug. 1957. (b) Periodic movements ($T\sim1$ hr, amplitude$\sim$8 n) of the F layer during a magnetically undisturbed night, 7–8 Aug. 1957. (c) Sudden ascent of the layer during a "Polar Sudden Commencement" ($\Delta h\sim60$ km) within $\frac{1}{2}$ hr on 15–16 Sept. 1956.) Existence of an $N(h)$-minimum above the normal E layer above Lindau, Germany, on 20 Aug. 57, 1545 hrs. *Subject Heading:* **1. Ionospheric height determination.**—*Author's abstract.* Ⓢ

11D–16 551.510.535(99)

Bellchambers, W. H. (*Royal Society Base, Halley Bay, Antarctica*) and Piggott, W. R. (*Radio esearch Station, Ditton Park, Slough, Bucks*), **Ionospheric measurements made at Halley Bay.** *ature*, London, 182(4649):1596–1597, Dec. 6, **1958.** fig., 2 refs. **DWB**—Some results of the nospheric measurements carried out in 1957 at the Royal Society Base at Halley Bay are presented. ctivity due to the incidence of corpuscular radiation reaches a maximum near 1400 L.M.T. (30°W) id more than $\frac{2}{3}$ of the examples are found between 0100 L.M.T. and 1000 L.M.T. The incidence high absorption is increased greatly at the equinoxes. The auroral radio echo index at Halley ay shows a similar diurnal variation but shifted in phase toward the earlier hours. Consistent current diurnal changes in the F layer are present; these indicate that the station is favorably cated for studying regular variations of this layer at high altitudes. "The ionograms obtained ear midnight in winter months show two distance reflecting structures in the F region; one which is quentially continuous with the F layer of the previous day, and the other, which usually first ppears with the characteristic shape normally attributed to oblique reflexion from a tilted layer, evelops into the F layer of the subsequent day. The main features of the diurnal variation of the -2 layer, critical frequency, f_oF2 indicates the following: (1) the large diurnal variation of electron ensity in winter, evident also in the total electron content of the layer, having a maximum near noon

L.M.T. despite the absence of significant photoionization due to solar radiation; (2) the season maxima of electron density in the day found at the equinoxes, these are similar to those found Port Luckroy and Port Stanley; (3) small diurnal variation in electron density in summer showing maximum near midnight L.M.T. *Subject Headings:* **1. Ionospheric measurements 2. F2 lay variations 3. Antarctic ionosphere 4. Halley Bay, Antarctica.**—*I.L.D.*

11D–17 551.510.535:550.38

Beynon, W. J. G. and Thomas, L. (*Dept. of Physics, Univ. Coll. of Swansea*), **Travelling dis turbances in region F2 and magnetic activity.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 131 132. fig., 3 refs.) **DWB**—An analysis of the results of a series of simultaneous normal incidenc ionospheric records made at Slough, Swansea, and Bangor is presented. The records show that th corresponding large scale irregularities in the F2 layer can be detected simultaneously. The result also show that the magnitude of the apparent velocity is closely correlated with the magnetic dis turbance and that there is a marked height gradient in the apparent horizontal motion in the F region. *Subject Headings:* **1. Ionospheric disturbances 2. F2 layer 3. Magnetic activity 4. Trave ing disturbances.**—*N.N.*

11D–18 551.510.535:550.38

†Beynon, W. J. G. and Brown, G. M. (*Univ. Colleges of Aberystwyth and Swansea*), **Geomagneti distortion of region-E.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):138–166 April **1959.** 21 figs., 34 refs., 14 eqs. **DLC**—A detailed consideration of the behavior of the norma E region shows the existence of minor perturbations from the classical Chapman theory. It is show that some of these differences can be ascribed to the influence of vertical drift of ionization resultin from the interaction of the earth's magnetic field and the S_q-current system flowing in or near th E layer. The resulting distortion of the electron density profile of the E layer is considered, wit particular reference to its effect on the values of the parameter foE at different latitudes. Th diurnal and seasonal changes in the magnitude of the east-west component current are clearl reflected in the variations of foE, and an index n, measuring the sensitivity of the E layer to seasona changes, shows marked singularities near the latitudes of the S_q-foci. An analysis of conditions o magnetically disturbed days is also given, and it is concluded that at temperate latitude station there is a depression in fE at times of magnetic disturbance comparable with the magnitude of tha associated with the vertical drift effect of the S_q-current system at noon in the summer. Referenc is also made to conditions near and within the auroral zone. Consideration of the effect of sporadi E ionization shows that this does not appear seriously to influence the tabulated values of fE. *Subjec Headings:* **1. Geomagnetic distortion 2. E layer 3. Sporadic E layer(Es) ionization.**—*Authors abstract.* Ⓢ

11D–19 551.510.535:550.38

Bhargava, B. N. and Gopala Rao, U. V. (*both, Kodaikanal Observ., Kodaikanal*), **Ionospheri disturbances associated with magnetic storms at Kodaikanal.** *Indian Journal of Meteorology an Geophysics*, Delhi, 10(2):203–208, April **1959.** 4 figs., table, 9 refs. **DWB, DLC**—F2 layer dis turbances at Kodaikanal have been analyzed for a study of the behavior of the critical frequency an the virtual height during geomagnetic storms. The disturbances have been classified for this purpose into two categories, namely: the positive and negative. The characteristics of Dst and S_D variation of foF2 and S_D variation of $h'F$ at night have been discussed. The results have been explained i terms of the quiet and disturbed day vertical drift velocities. *Subject Headings:* **1. Ionospheri disturbances 2. Magnetic effects on ionosphere 3. Kodaikanal, India.**—*Authors' abstract.* Ⓢ

11D–20 551.510.535

Bibl, K. and Rawer, K. (*both, Ionosphären-Inst. Breisach, Deutsche Bundespost, Ger.*), **Traveling disturbances originating in the outer ionosphere.** *Journal of Geophysical Research*, Wash., D. C. 64(12):2232–2238, Dec. **1959.** 6 figs., 13 refs. **DLC**—Some observations that have been obtained with variations of the classical echo-sounding method must be interpreted as resulting from perturbation and/or oscillation phenomena occurring in the outer ionosphere. The vertical velocity component of 'traveling disturbances' coming from outside and propagating through the ionosphere is determined as 115 ± 35 m/sec. Oscillation-like phenomena have a large range of quasi-periods between $\frac{1}{4}$ and 12 hours. *Subject Headings:* **1. Ionospheric disturbances 2. Traveling disturbances** —*Authors' abstract.* Ⓢ

11D–21 551.510.53

Bjelland, B.; Holt, O.; Landmark, B. et al. (*all, Norwegian Def. Res. Estab., Kjeller*), **The I region of the ionosphere.** *Nature*, London, 184(4691) Supp. 13:973–974, Sept. 26, **1959.** 3 figs, 3 refs. **DWB**—A short note on two sets of observations made at Kjeller near Oslo and near Troms

in Norway. At Kjeller measurements of ionospheric cross modulation were made during March 1957–May 1958 by means of the pulse technique. Some typical results from these observations are presented. A typical record sample from observations and results from winter observations are graphically represented. Observations were made during 1958 near Tromsö of the D region during disturbed conditions. Some results obtained from the first short series of observations are discussed and graphically represented. *Subject Headings:* **1. D layer 2. Norway. I. Lied, F.**—*I.S.* Ⓢ

11D–22 551.594.12: 551.510.535:550.388

Bossolasco, M. and Elena, A. (*both, Inst. Geof. Geod. Univ. Genoa, Italy*), **On some characteristics of the E_s-layer.** *Planetary and Space Science*, N. Y., 1(3):205–212, Aug. **1959.** 3 figs., 10 refs. **DWB**—Some aspects of the dependence of the Es ionization on the geomagnetic field are derived; further, an attempt is made to deduce the mean world-wide drift direction of Es in summer, using the time displacement that occurs for the daily maxima of the hourly median values of *fo*Es. *Subject Headings:* **1. Sporadic E layer (Es) drift 2. Geomagnetic effects on ionization.**—*Authors' abstract.* Ⓢ

11D–23 551.510.535

Brice, N. M. (*Univ. Queensland, Brisbane*), **Variations in ionospheric F-region characteristics.** *Australian Journal of Physics*, Melbourne, 11(4):587–591, Dec. **1958.** fig., table, 6 refs. **DLC**—Curves of height and density at the level of maximum ionization were computed from Macquarie Island *h'f* records obtained since 1950 (they are believed to be the first high southern latitude (*N,h*) profiles). It is found that heights of max. electron density of both F1 and F2 layers are greater at sunspot maxima than at sunspot minima. Diurnal and seasonal variations of electron content below max. density, and scale heights are also discussed, and averages of all the above parameters are tabulated for sunspot max. and min. in summer and winter, day and night. *Subject Headings:* **1. Ionospheric data 2. Macquarie Island.**—*W.N., G.T.*

11D–24 551.510.535:551.594.12

Briggs, B. H. (*Cavendish Lab., Cambridge, England*), **Some characteristics of sporadic-E ionization as determined by a rapid frequency sweep experiment.** *AGARDograph*, Paris, No. 34:151–161, Sept. **1958.** 8 figs., 10 refs., 3 eqs. **DWB** (629.1323 N864a)—In the experiments described the frequency of a pulse transmitter was varied rapidly over a frequency range of ½ Mc/s in about ½ sec., and a receiver was kept in tune by electronic means. The amplitudes of echoes from the Es layer and the F layer were recorded as functions of frequency. By comparison with the theory of reflection from a "thin" ionized layer the thickness of the Es layer is determined. Some records also enable the collision frequency of electrons to be found from a study of the absorption near the critical frequency of the Es layer. Other results relating to the fading of the Es and F echoes are described. *Subject Headings:* **1. Sporadic E layer (Es) ionization 3. Sweep frequency measurement.**—*Author's abstract.*

11D–25 551.501.9:551.510.535(99)

Bukin, G. M., **Ionosfernye nabliudeniia na stantsii Vostok.** [Ionospheric observations at Vostok station.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG (IGY), Informatsionnyĭ Biulleten'*, No. 5:45–46, **1958.** 1 fig. **DWB**—Since Feb. 27, 1958 the south pole station, Vostok, situated in the interior of the continent, 1410 km from Mirny began round the clock continuous ionospheric observations, by means of a new model Soviet automatic ionospheric station. The principal technical features of the station are listed. A graph giving mean values of *fo*F2, *fo*F1 and *fo*F for the period March 1–20, 1958 is presented. The F2 layer has a definite diurnal variation with a maximum at midday and it is symmetrical with respect to noon. The effect of delay, which is characteristic for high latitude stations is not evident. The daily variation of *fo*F1 is expressed less markedly than *fo*F2 but it still shows some rise in critical frequencies towards midday. The E layer was observed round the clock in March since its critical frequency varies proportionally with the variation of the zenith angle of the sun both during the diurnal and seasonal course. The minimum usable frequencies increase towards midday but at night they remain below the lower limit of the apparatus. The diffuseness of reflections at Vostok was considerably less than at Mirny. *Subject Headings:* **1. Ionospheric stations 2. Ionosphericobse rvations 3. Vostok, Antarctica.**—*I.L.D.*

11D–26 551.510.535:551.507.362.1

Burkard, Otto, **Modell der Ionosphäre.** [Model of the ionosphere.] *Die Naturwissenschaften*, Berlin, 45(210):507, Nov. 1, **1958.** fig. **DLC**—A Russian notice makes mention of an unexpected concentration of electrons at an altitude of 470 km that was established by a rocket on the 21st Feb. 1958—proof that remarkable indications concerning electron concentration in that part of ionosphere have been collected. The author shows that according to these observations the model

of the ionosphere he published in *Geofisica Pura e Applicata* (1957), is valid. *Subject Headings* **1. Electron concentration 2. Rockets.**—*A.V.*

11D–27 551.510.535:551.594.13:551.507.362.2

Cahill, Laurence J., Jr. and Van Allen, James A. (*both, Dept. of Physics, State Univ. of Iowa*) **New rocket measurement of ionospheric currents near the geomagnetic equator.** *Journal of Geophysical Research*, Wash., D. C., 63(1):270–273, March **1958.** 2 figs. **DLC**—Gives record of new rocket measurement of ionospheric currents as conducted by the State University of Iowa Rockoon Flight No. 86 at 161°W long. and 00° lat, on Oct. 18, 1957. The results of this investigation prove the existence of electrical currents in the lower ionosphere. The analyses of other findings are given. Other magnetometer flights are being studied, and they may yield information concerning the latitudinal extent of the equatorial current system. *Subject Headings:* **1. Rocket ionospheric measurements 2. Ionospheric currents 3. Geomagnetic equator.**—*N.N.*

11D–28 551.510.535

Chandra, Sushil; Gibbons, J. J. and Schmerling, E. R., **Vertical transport of electrons in the F region.** *Journal of Geophysical Research*, Wash., D. C., 65(4):1159–1175, April **1960.** 24 figs., 12 refs., 6 eqs. **DLC.** Also issued as: Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-3875), Scientific Report No. 124, Oct. 1, **1959.** 44 p. 24 figs., 18 refs., 3 eqs. **DWB** (M10.535 P415i)—The continuity equation of electron density is solved to yield an expression for the vertical transport which can be evaluated from electron-density-true-height profiles. A few numerical computations are presented of the vertical drift velocities determined for the four IGY stations: Huancayo, Talara, Panama and Washington. It is shown that the velocity is predominantly downwards during the night and upwards during the day at the equatorial stations. There is an apparent phase reversal from summer to winter at Washington. The order of magnitude of the vertical velocity amplitude is 25 m/sec. There is substantial agreement between the values calculated here from ionospheric data and those deduced from S_q data on the dynamo theory. *Subject Headings:* **1. Ionosphere vertical currents 2. Dynamo-theory of ionosphere.**—*Authors' abstract.* Ⓢ

11D–29 551.510.535:550.388

Clemmow, P. C. and Johnson, M. A. (*both, A.S.R.E., Portsdown, Cosham, Hants.*), **A contribution to the theory of the motion of weak irregularities in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):21–36, Oct. **1959.** 3 figs., 3 tables, 3 refs., 62 eqs. **DWB, DLC**—The motion of weak irregularities in an otherwise homogeneous slightly ionized gas under the influence of electrostatic and magnetostatic fields is investigated. The governing equations are set out and the dispersion equation for harmonic plane wave solutions is obtained and solved. It is shown that, to a good approximation for ionospheric applications, and with the neglect of diffusion, a plane wave travels with negligible attenuation with a velocity which is (a) proportional to the magnitude of the electrostatic field, (b) independent of the wavelength, (c) dependent on the direction of the wave-normal. As a particular consequence, any weak two-dimensional irregularity which is parallel to the direction of the magnetostatic field travels unchanged; so also does any one-dimensional irregularity, and in this case the analysis is unaffected by its strength. The effects of diffusion are examined. *Subject Headings:* **1. Ionospheric drift 2. Ionospheric diffusion.**—*Authors' abstract.* Ⓢ

11D–30 551.510.535

*Cologne. Universität. Meteorologisches Institut, **Ergebnisse der Ionosphärenbeobachtungen,** [Results of ionospheric observations]. No. 1, 1957. Latest issue seen, No. 3, **1958.** 7+7+18 p. Almost entirely tables. Preface, No. 1, signed H. Berg.—Ionospheric disturbances have been investigated by the impulse echo method since 1941/42 at Cologne University. As of 1954 the identical problem was studied simultaneously at the Cavendish Institute in Cambridge, and in 1956 the studies gained by reconstructional improvement of the instrumentation described. The observations are conducted from 00.00 to 24.00 h, 3 days a month. The about 20 extremes obtained during the 5 min. runs are processed to yield: number of echoes, time differences, amount of mean time vector direction of the mean ionospheric displacement vector, m/sec velocity of the disturbances, and apparent height of the reflective layer, which are here tabulated as follows: in issue No. 1, for Nov. 7, 1956–Feb. 18, 1957; in No. 2, for March 25, 1957–Aug. 26, 1957, and in No. 3, for Sept. 21, 1957–May 19, 1958. *Subject Headings:* **1. Ionospheric data 2. Cologne, Germany. I. Berg, H.**—*W.N.*

11D–31 551.510.535:551.594.12

Cummack, C. H. (*Christchurch Geophys. Observ., New Zealand*), **"Chapman behaviour" in the lower ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, New York, 14(3/4):229–235, June **1959.** 4 figs., 6 refs., 9 eqs. **DWB, DLC**—It is shown that Chapman's relations for the variation of critical frequency and height of a layer with solar zenith angle can be applied to any point on

that layer and it is not necessary to assume monochromatic radiation. These results are then applied to electron density vs. height profiles and it is shown that "Chapman behaviour" can be detected to a height of 160 km being consistent with a scale height of 10 or 15 km. *Subject Headings:* **1. "Chapman behavior" 2. Electron density 3. Ionospheric critical frequencies.**—*Author's abstract.* Ⓢ

11D–32 551.510.535:551.594.12

*Davidson, David, **Characteristics of sporadic-E ionization at middle latitude.** Harvard Univ. Cruft Lab., Technical Report, No. 230, June 15, **1955.** 85 p. tables, 41 refs., eqs., numerous figs. (incl. photos). **DWB**—A major report on results of 1951–1954 studies of sporadic E phenomena using a 3-station (Concord, Gloucester and Sandwich, Mass.) base line of 100 km. Cloud velocities of 400 to 1000 km/hr, prevailing from the ENE, around midnight local time, and favoring periods of marked geomagnetic or auroral activity, were noted. Several forms were observed, but the predominant form was that of multiple reflections from a thin layer at 100–120 km height. In Oct. through Dec. there was an inverse relation between sunspot and sporadic E incidence and even better if the square of the *fo*F2 non median values is used instead of sunspot number. This relation breaks down at the equinoxes. Data, charts, graphs and references are given *in extenso*. *Subject Headings:* **1. Sporadic E layer (Es) ionization.**—*M.R.*

11D–33 551.510.535:621.37

Dessler, A. J. (*Lockhead Corp., Palo Alto, Calif.*), **Ionospheric heating by hydromagnetic waves.** *Journal of Geophysical Research*, Wash., D. C., 64(4):397–401, April **1959.** 2 figs., table, 14 refs. **DLC**—The rate of energy dissipation per unit volume is investigated for hydromagnetic waves traveling downward through the ionosphere. A calculation of the heating rate is made, based on assumptions as to the amplitude and Fourier spectrum of the hydromagnetic waves. It is argued in a general way that the peak heating rate due to hydromagnetic waves occurs near 175 km. The results, which are strongly dependent on the assumed values for the amplitude and Fourier spectrum of the hydromagnetic waves, indicate that hydromagnetic heating is normally not important in determining the temperature of the F region. However, during a magnetic storm, the hydromagnetic heating may become the dominant source of heat in the F region. The suggestion is made that the observed lifting of the F region during a magnetic storm is due to an increased heating rate caused by the storm-generated hydromagnetic activity. It is shown that it is not possible to account for the main phase of a magnetic storm by ionospheric heating. *Subject Headings:* **1. Ionospheric heating 2. Hydromagnetic heating of F region 3. Hydromagnetic waves.**—*Author's abstract.* Ⓢ

11D–34 551.510.535

Dieminger, W. (*Max Planck Inst. für Aeronomie, Germany*), **Transient fine structure of the E-layer.** *Journal of Atmospheric and Terrestrial Physics*, 16(1/2):179, Oct. **1959.** ref. **DWB, DLC**—Routine ionograms obtained at Lindau (nr. Northeim, Hannover) since 1950 show a complicated fine echo structure between *fo*E and f_{min}F2, varying from one record to another. In anticipation of a detailed analysis it is suggested: 1) variations of virtual height of the intermediate echoes are due to varied retardation controlled by electron density within the stratification and 2) the multiple structure of the retarded F2 trace may be explained by vertical and off-vertical reflections. *Subject Headings:* **1. Ionospheric fine structure 2. E layer.**—*W.N.* Ⓢ

11D–35 550.385:551.510.535:551.557

Dokuchaev, V. P., **O vliianii magnitnogo polia Zemli na vetry v ionosfere.** [Effect of the earth's magnetic field on ionospheric winds.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:783–787, **1959.** 16 refs., 19 eqs. **DWB, DLC**—The author shows that in the theoretical interpretation of winds above 100 km it is necessary to take into account possible deviation from the geostrophic wind associated with the action of electromagnetic forces. The relationship between electrodynamic and hydrodynamic processes in the ionosphere is established by the action of the magnetic field of the earth upon the induction current arising during the movement of the conducting medium within this field. In magnetic hydrodynamics, for a medium possessing electrical conductivity, the equations of Navier-Stokes include the total electrodynamic force. If Coriolis force and the force of gravity are added then the equations assume the form

$$\frac{\partial V}{\partial t} + (V\nabla)V = -\frac{\Delta P}{\rho} + \frac{1}{\rho c}[jxH_0] - g + 2[wV] + v\nabla^2 V$$

where V and ρ = velocity and density of the medium respectively, v = kinematic viscosity, g = acceleration of gravity, w = angular rotation of the earth, H_0 = magnetic field of the earth, j = density of the electric current. In case of an anisotropic medium the generalized Ohm's law for an incompletely ionized gas is written as

$$j = \sigma_0(E'h_0)h_0 + \sigma_1[h_0 \times E'] \times h_0 + \sigma_2[h_0 - E']$$

where E = potential of the electric field, h_0 = unit vector of the magnetic field and σ_0, σ_1 and σ_2 a parallel conductivity, transverse conductivity and the Hall conductivity, respectively. On the bas of these expressions the author obtains a simplified system of equations of x, y coordinates,

$$\frac{du}{dt} - \left(2w_z + \frac{\sigma_2 H_0 H_z}{\rho c^2}\right) v + \frac{\sigma_1 H_0^2}{\rho c^2} u = -\frac{1}{\rho}\cdot\frac{\partial p}{\partial x}$$

$$\frac{dv}{dt} + \left(2w_z + \frac{\sigma_2 H_0 H_z}{\rho c^2}\right) u + \frac{\sigma_1 H_z^2}{\rho c^2} v = -\frac{1}{\rho}\cdot\frac{\partial p}{\partial y}$$

The solution of this system of equations is presented. In the stationary state the velocity of th wind in the E-layer is given by

$$u = -\frac{\Omega}{\rho(\lambda^2+\Omega^2)}\cdot\frac{\partial p}{\partial y}; \qquad v = -\frac{\lambda}{\rho(\lambda^2+\Omega^2)}\cdot\frac{\partial p}{\partial y}$$

where

$$\lambda = \frac{\sigma_1 H_z^2}{\rho c^2} \quad \text{and} \quad \Omega = 2w_z + \frac{\sigma_2 H_0 H_z}{\rho c^2}$$

The stationary gradient wind in the F-layer is given by $u = -\frac{\Omega}{\rho\lambda^2}\frac{\partial p}{\partial y}$ and $v = -\frac{1}{x\rho}\frac{\partial p}{\partial y}$. *Subje Headings:* **1. Magnetic effects on ionosphere 2. Ionospheric winds.**—*I.L.D.* Ⓢ

11D–36 551.510.53

Electron density profiles in the ionosphere. *Nature*, London, 181(4626):1770, June 28, **1958 DWB**—The Radio Research Station of the Department of Scientific and Industrial Research, a Slough, has organized a program for computing electron density and the true height of the variou layers of the ionosphere, as a part of the United Kingdom's program of observations during the IGY Data are obtained from four stations—Slough, Ibadan, Singapore, and Port Stanley. *Subje Headings:* **1. Ionospheric electron density 2. Ionospheric research programs.**—*N.N.*

11D–37 523.75:551.510.53

Ellison, M. A. (*Royal Obs., Edinburgh*), **Solar flares.** (In: Beer, Arthur (*ed.*), **Vistas in as tronomy.** pub. London, **1955–56.** Vol. 2:799–807. 4 figs., 14 refs.) **DLC, DWB** (520.82 B415v)— A review of the progress during the past 25 yrs and present knowledge of solar flares and their relatio to sudden disturbances in the ionosphere, fadeouts, radio noise, etc. General properties of sola flares, flare spectra, ionospheric effects and radio emission are discussed at some length and recen theoretical work reviewed. *Subject Headings:* **1. Solar flares 2. Solar-ionospheric relationship** —*M.R.*

11D–38 551.510.535:551.507.362.1

†Friedman, Herbert, **Rocket observations of the ionosphere.** *Institute of Radio Engineers Proceedings*, 47(2):272–280, Feb. **1959.** 9 figs., 2 tables, 26 refs., 2 eqs. **Correction in** *Ibid.*, 47(4) 567, April **1959. DLC**—Daytime electron density profiles measured at Fort Churchill have bee found to be similar to those observed at White Sands. One winter nighttime flight showed very little ionization, less than 20,000 electrons per cc up to 165 km. Polar blackout produced strong enhancement of the D region electron density down to 55 km. NO^+ is the predominant ion below 200 km during the night, but O^+ becomes the most abundant ion above 150 km during the day Solar flares are accompanied by X-ray bursts capable of penetrating to the 60 km level and sufficiently intense to account for sudden ionospheric disturbances. At night a diffuse glow of Lyman-α i visible over the entire sky. From the observed intensity it is possible to estimate the electron density of interplanetary space. *Subject Headings:* **1. Rocket ionospheric data 2. Fort Churchill Manitoba 3. White Sands, N. M.**—*Author's summary.* Ⓢ

11D–39 551.510.53

Gibbons, J. J. and Waynick, A. H., **The normal D region of the ionosphere.** *Institute of Radi Engineers, N. Y., Proceedings*, 47(2):160–161, Feb. **1959.** 11 refs., eqs. **DLC**—The general theory of low-frequency sounding in the lower ionosphere is discussed in order to indicate the radio trans mission characteristics which a D-layer model must satisfy. D layers based on the fundamenta physical processes from 60 to 90 km, which have been presented up to now, have not been completely satisfactory. There is indication that the more accurately determined values of fundamenta parameters now available, such as reaction rates, will lead to a more satisfactory model. *Subje Heading:* **1. D layer.**—*Authors' summary.* Ⓢ

11D–40 551.510.535:51.590.24

Gledhill, J. A. (*Dept. of Physics, Rhodes Univ., Grahamstown, So. Africa*), **The effects of a solar eclipse on a stratified ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4): 360–366, Nov. **1959.** 3 figs., table, 7 refs. **DWB, DLC**—The effects of an eclipse on a simple three-layer ionosphere, in which the recombination coefficient decreases with height, have been computed. The results are displayed in the form of a contour map and show relatively large tilts of the iso-electronic surfaces near the layer maxima. The development of a "valley" between the F1 and F2 layers after the maximum of the eclipse is of particular interest. It is pointed out that such a valley may cause considerable errors in the interpretation of the behavior of the F2 layer. *Subject Heading:* **1. Solar eclipse effects on ionosphere.**—*Author's abstract.* Ⓢ

11D–41 551.510.535:551.590.24

Gledhill, J. A., **The behaviour of the ionosphere over Cape Town and Johannesburg during the annular solar eclipse of Dec. 25, 1954.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):367–375, Nov. **1959.** 7 figs., table, 11 refs. **DWB, DLC**—Data are presented showing the variation of the critical frequencies for the ordinary ray in the E, F1 and F2 regions at Cape Town and Johannesburg during the eclipse of 25 Dec. 1954. The maximum obscuration was 79% at Cape Town and Johannesburg. It was not possible to deduce a solar model which would account satisfactorily for the data from both stations and those from Grahamstown, published earlier. Reasons are given for believing that oblique reflections affected the records and it is pointed out that the plot of *fo*E vs. *fo*F1, used by MINNIS to justify neglect of the reflections, is in fact not linear throughout an eclipse. There is some evidence for a high value of the recombination coefficient, 4×10^{-8} cm³/sec, in the E layer. *Subject Headings:* **1. Solar eclipse effects on ionosphere 2. South Africa.**—*Author's abstract.* Ⓢ

11D–42 551.510.535:537.531:551.510.52

Gregory, J. B. (*Physics Dept., Univ. of Canterbury, Christchurch, New Zealand*), **Medium-frequency observations of the lower ionosphere during sudden disturbances.** *Journal of Geophysical Research*, Wash., D. C., 63(1):273–275, March **1958.** 2 figs., 4 foot-refs. **DLC**—Suggestions made by FRIEDMAN and CHUBB as to the cause of sudden ionospheric disturbances are verified. It is confirmed that such disturbances may be attributed to an increase in the soft X-ray flux that penetrates to the lower ionosphere, rather than to an increase in the intensity of Lyman α-radiation. This paper also traces the origin of partial reflections in the lower ionosphere and indicates that meteorological factors are involved. *Subject Headings:* **1. Ionospheric disturbance theories 2. X-radiation.**—*N.N.*

11D–43 551.510.535

Gusev, V. D.; Huang, Si-wen and Li, Jun, **On the use of the correlation method for determining the parameters of the inhomogeneities of the ionosphere.** *Acta Scientiarum Naturalium Universitatis Wuhanensis*, No. 6:23–28, **1959.** In Chinese. Unchecked.—In applying the correlation method to the study of the parameters of the inhomogeneities in the structure of the ionosphere, it is generally assumed that the contour surfaces of concentric ellipsoids for ρ, the correlation function of the amplitudes of reflected waves, are similar. In this article, the authors have taken up a study of the methods of examining this hypothesis. Examination of the records obtained both at Wuhan and at Moscow shows that for 70% of the cases the contour surfaces for ρ are ellipsoidal. But for different values of ρ, there are only a few cases which have similar surfaces. Therefore for different contours, the parameters for the inhomogeneities are different. *Subject Heading:* **1. Ionospheric structures.**—*Science Abstracts of China.* Ⓢ

11D–44 523.164.32:551.510.535

Hachenberg, O. and Krüger, A. (*both, Heinrich-Hertz-Inst., Deutschen Akad. der Wissenschaften zu Berlin*). **The correlation of bursts of solar radio emission in the centimetre range with flares and sudden ionospheric disturbances.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):20–33, Dec. **1959.** 9 figs., 2 tables, 16 refs. **DWB, DLC**—From statistical investigations of solar flares, of bursts of solar radiation in the centimeter range and of the accompanying effects of sudden ionospheric disturbances (SID) recorded during the first 6 months of the IGY, it follows that there exists a close correlation between bursts in the centimetre range and SID. Only those flares, which give rise to a centimeter burst, are also able to cause a SID. Both flares and the ionizing radiation of the ionospheric D layer have their origin in the chromosphere. The close correlation confirms our view that the ionizing radiation as well as the centimeter radiation of the flares are generated by superthermal electrons. The ionizing radiation is evidently a "Bremsstrahlung" of the X-ray region. *Subject Headings:* **1. Solar ionospheric relationships 2. Solar radio bursts 3. Bremsstrahlung.**—*Authors' abstract.* Ⓢ

11D–45 551.510.535:550.3

Hájková, Jaroslava and Mrázek, Jiri (*both, Geophysical Inst. Acad. of Sci., Prague*), **Ein Zusar menhang der nächtlichen E-Schicht mit der geomagnetischen Aktivität.** [Relationship of th nocturnal E layer to geomagnetic activity.] *Studia Geophysica et Geodaetica*, Prague, 3(2):195–19 **1959.** 4 figs., 4 refs., eq. Russian summary, p. 198. **DWB**—Based on observations at the Ion spheric Observatory at Lindau (50°39′N, 10°8′E), and the Geomagnetic Observatory at Wing (53°45′N, 9°4′E), the relationship between the night sporadic E (Es) and geomagnetic activity shown. More often geomagnetic disturbances result from Es changes than Es changes follow ge magnetic disturbances. The various types of geomagnetic phenomena must be tested separatel geomagnetic storms, bay disturbances and pulsations. *Subject Headings:* **1. Sporadic E layer (Es geomagnetic relationships 2. Geomagnetic disturbance causes 3. Lindau, Germany 4. Wings Germany.**—*M.R.* Ⓢ

11D–46 551.510.535(48

Harang, Leiv (*Norwegian Defense Res. Establishment*), **Results of ionospheric drift measuremen in Norway.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 2, Ionospher Section,** N. Y., Pergamon Press, **1958.** p. 26–32. 12 figs., ref.) Also issued in *Journal of A mospheric and Terrestrial Physics*, London, Special Supplement, Pt. 2, 1957, pub. **1958.** p. 26–3 **DWB, DLC**—During 1953–1955 E layer drift measurements were made in Norway according to th Mitra method. The graphs presented show the diurnal variations during the year together with th annual means for the two years. Values of drift for Kjeller, Norway are compared with simila recordings from Washington and Cambridge. The wind vectors for Kjeller are schematicall illustrated together with the distribution curves. *Subject Headings:* **1. Ionospheric drift measure ments 2. Norway.**—*N.N.*

11D–47 551.510.535:551.55

Harnischmacher, E. and Rawer, Karl, **Drift observations evaluated by the method of "simila fades."** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):1–16, Dec. **1958.** 12 figs 12 refs., 16 eqs. **DLC**—A regular interference model of the fading pattern is considered as oppose to the usual accepted purely random model. It would appear that some of the observed feature are well explained by a model which is intermediate between these two types insofar as regula interference perturbations are concerned, but one in which a finite lifetime for the irregularities i supposed. It appears that with the "similar fade" analysis there is a marked tendency to selec those periods where the interference is quite regular and the rather small angular dispersion foun in most sets of observations can thus be explained. The observed big dispersion of the speed is a least partially due to a small vertical component of the movement. *Subject Heading:* **1. Ionospheri drift observation 2. "Similar fade" analysis of ionospheric drift.**—*Authors' abstract.*

11D–48 551.510.535:551.55

Harnischmacher, E. and Rawer, K., **Ionosphärische Windmessungen in der E-region Nov 1956 bis Jan. 1957.** [Ionospheric wind measurements in the E region Nov. 1956–Jan. 1957. *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 31(1/2):131–134, **1958.** 3 figs. **DWB, DLC**— Continuation of the measurements published *Ibid.*, 29(4):253–268 (*see* 9.9–216, Sept. 1958, *MAB*) Graphs giving mean hourly ionospheric wind velocities in m/sec in the E layer obtained durin November and December 1956, and January 1957, are presented. *Subject Headings:* **1. Ionospheri wind measurements 2. Ionospheric drift 3. E layer.**—*I.L.D.*

11D–49 551.510.535:551.55

Harnischmacher, E., **Ionospheric drifts in Puerto Rico obtained by the method of analysi developed in Neuf-Breisach.** Puerto Rico Univ. College of Agriculture and Mechanic Arts, Con tract AF 19(604)-2036 (Study of ionospheric winds), Scientific Report No. 5, Dec. **1958.** 15 p 28 figs., table. **DWB**—The method of Similar Fades for determination of ionospheric drifts wit spaced receivers is first discussed together with modifications and simplifications in the calculatin procedure introduced at Neuf-Brisach. The records used and their analysis according to thi method are then discussed. The results are then set forth together with comments on certai regularities observed in the ionospheric drifts. *Subject Heading:* **1. Ionospheric drift measurement** —*Author's abstract.*

11D–50 551.510.53

Haubert, A., **Sur un phénomène de marée ionosphérique observé à Casablanca.** [Ionospheri tide phenomenon observed at Casablanca.] *Rabat, Morocco, Institut Scientifique Chérifie Institut de Physique du Globe et de Météorologie, Annales*, 16:165–166, **1956.** 2 plates, 3 refs. **DLC**— Observations of nocturnal ionospheric tides, different from the diurnal thermal tides observed durin summer days at Casablanca. The frequency table of those tides which occurred from 1952 to 195

shows that the phenomenon is more frequent at 5 h than at 21 h, and that it is at both hours three to four times greater in winter than in summer. The fact that, at the beginning of the phenomenon, ionization may subsist for a long time at low altitudes when there is no solar illumination, indicates a concentration of electrons. The author examines three possible mechanisms of such concentration: compression of the layer, cutting off of electrons starting from negative ions and, finally, horizontal currents. *Subject Headings:* **1. Ionospheric tides 2. Casablanca, Morocco.**—*A.V.*

11D–51 551.510.535:621.396.826

Haubert, A., **Echos radioélectriques observés sur la houle à la station de sondages ionosphériques de Casablanca.** [Radio echoes from sea waves observed at the ionospheric station of Casablanca.] *Annales de Géophysique*, Paris, 14(3):368–372, July/Sept. **1958.** 7 figs., 3 refs., 7 eqs. **DLC**—Echoes thought to be reflected from virtual heights lower than 100 km (D region of the ionosphere), have been recorded since the end of 1953, at the ionospheric station of Casablanca. The particular forms of these echoes suggested possible reflections from sea waves, the ionospheric station being located near the sea shore. The results of experiments are in agreement with the theory of a Doppler effect of sea waves. Consequently, the measurements of sea wave periods and lengths, from distances as far as 100 km, would be possible by means of ionospheric sounders equipped with special devices. *Subject Headings:* **1. Ionospheric echoes 2. Doppler effect of sea waves 3. Casablanca, Morocco.**—*Author's abstract.*

11D–52 551.510.535

†Hines, C. O. (*Defence Res. Board, Ottawa*), **Motions in the ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):176–186, Feb. **1959.** 3 figs., 70 refs., 2 eqs. **DLC**—The ionosphere, even in its "undisturbed" state, is constantly in motion. Its charged and uncharged constituents may travel together or independently, while irregularities in the distribution of charge may take a different course again. The pertinent observational data are extensive and, in some cases, conflicting; their interpretation is seldom direct. The theoretical factors affecting that interpretation are becoming clear, though in some cases their areas of relevance are still subject to divergent opinions. An attempt is made here to bring into focus the theoretical factors themselves, to record their bearing on the observations wherever it has been established, and to suggest paths of future progress wherever it has not. Details of observational results and theoretical developments are largely suppressed, and with them the conflicts and discrepancies which, however real, would obscure the presentation of the principles involved. *Subject Heading:* **1. Ionospheric movements.**—*Author's summary.* Ⓢ

11D–53 550.388:551.510.535(98/99)

Hines, C. O., **On the rotation of the polar ionospheric regions.** *Journal of Geophysical Research*, Wash., D. C., 65(1):141–143, Jan. **1960.** 2 refs., 12 eqs. **DWB, DLC**—The possibility of magnetic coupling between the polar regions of the earth's ionosphere and the interplanetary gas has led to the suggestion that the polar ionosphere may not rotate with the earth. The depth to which the effects of the interplanetary drag might penetrate is examined here with the aid of two simple models. The results are not conclusive, but they do indicate that heights as low as the E region may be involved. *Subject Headings:* **1. Polar ionosphere 2. Magnetic effects on ionosphere.**—*Author's abstract.* Ⓢ

11D–54 551.510.535:550.384.4

†Hirono, Motokazu (*Geoph. Inst., Kyoto Univ.*), **A theory of diurnal magnetic variations in equatorial regions and conductivity of the ionosphere E region [Pt. 1].** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 4(1):7–21, April **1952.** 7 figs., table, 20 refs., 40 eqs. **DLC**—In two previous papers, author suggested that the electrical conductivity in E-W direction of the E region in a narrow belt along the magnetic equator is much greater than in the other latitudes, on account of a polarization field produced by the Hall Current, provided that λ is much less than 10; and that this high conductivity will cause enhanced diurnal magnetic variations near the magnetic equator. In this paper, this theory is discussed further in detail. A dynamo theory for the E region with anisotropic conductivity, which is linked by highly conductive lines of magnetic force to the F region, is examined. A case that the E layer only makes a tidal oscillation, which produced observed lunar diurnal current system, is calculated. It is found that, in middle latitudes, the induced polarization field in E-W direction by the Hall Current is greater than that by the direct current, and the vertical drift of the F2 layer by this polarization field seems to be adequate for the observed F2 lunar variation. According to the present theory, conductivity of the E region at the magnetic equator decreases with increase of the main magnetic field, and the distribution of range of magnetic variations along the magnetic equator reported by EGEDAL, seems to support this relation. *Subject Headings:* **1. Diurnal magnetic variations 2. Ionospheric conductivity 3. E layer.**—*Author's abstract.*

11D–55 551.510.535:550.384

†Hirono, M., **A theory of diurnal magnetic variations in equatorial regions and conductivity of the ionosphere E region, Pt. 2.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 5(1/2):22–3 June **1953.** 11 figs., table, 25 refs., 42 eqs. **DLC**—In succession to Pt. 1, the electrical conductivity of the E region is calculated in some detail for two atmospheric models. It is shown that the factor by which the tidal oscillation of the E region exceeds that at ground level, should be less than 10^3, i order to give the observed lunar magnetic variation. The calculated lunar vertical movement of th E region is nearly in phase with that observed in South England and nearly opposite at Canberra A possibility is shown that the calculated lunar vertical movement of the F2 region roughly agree with that observed. It is suggested that the vertical drifts of the F2 region near the magneti equator may be much greater than those in the other latitudes. *Subject Headings:* **1. Ionospheri conductivity 2. E layer.**—*Author's abstract.*

11D–56 551.510.535:550.385.2

†Hirono, M. and Maeda, Hiroshi (*Geoph. Inst., Kyoto Univ.*), **Geomagnetic distortion of the F region on the magnetic equator.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 6(3):127–144 Sept. **1954.** 11 figs., 5 tables, 33 refs., 19 eqs. Also in: *Journal of Geophysical Research*, Wash., D. C 60(3):241–255, Sept. **1955.** 7 figs., 4 tables, 29 refs., eqs. **DLC**—The direct relation between th geomagnetic S_q variation and the vertical electron drift in the F2 region on the magnetic equator i examined. It is shown that the electric field in the F2 region accompanied by S_q electric curren produces the vertical drift which is sufficient to interpret the main features of the anomaly of the F region on the equator. It is to be noticed that the main term of the drift velocity is diurnal. Th daily variations of the maximum electron density and its height in the F2 region are calculated unde consideration of the vertical electron drift for the reasonable distribution of decay coefficient wit altitude inferred by observed results. The calculated F2 daily variations have a striking resemblanc with those observed near the magnetic equator. When the ion production takes its maximum value at about 200 km, there appears a lower secondary maximum of electron density which agrees wel with the observed F1 layer. The change of characteristics of daily variations of the F2 region wit the sunspot cycle is likely to be accounted for by a slight shift of the phase of the drift. *Subjec Headings:* **1. F2 layer 2. Geomagnetic effects.**—*Authors' abstract.*

11D–57 551.510.535:551.594.13

Hirsh, A. J. (*Cavendish Lab., Cambridge*), **The electron density distribution in the F-region of the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):86–95, Dec. **1959** 9 figs., 8 refs., 22 eqs. **DWB, DLC**—The suggestion of Bates and Massey that the F1 and F2 layers of the ionosphere are formed by a single type of radiation, ionizing an atmosphere in which the electrons are lost by a double process of charge exchange followed by dissociative recombination, is examined in numerical detail. It is shown that under certain circumstances this could lead to the type of $h'(f)$ curve observed in practice. It is also shown that the magnitudes of some of the quantities involved must lie within certain ranges. *Subject Headings:* **1. Ionospheric electron density distribution 2. F layer ionization.**—*Author's abstract.* Ⓢ

11D–58 551.510.535:551.507.362.1

Hok, Gunnar and Dow, W. G. (*Electrical Eng. Dept., Michigan Univ.*), **Exploration of the ionosphere by means of a Langmuir-probe technique.** (In: Boyd, R. L. F., Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 240–246. 6 figs., 5 refs.) **DWB**—Irving Langmuir and his team developed in 1920 a method of measuring the concentration and energies of ions and electrons in electrical discharges in gases. A cylindrical probe was used to observe the positive ions in the current. Today, high-flying rockets have carried the probes into the ionosphere where ion electron plasma exists. From White Sands Proving Grounds in New Mexico, reducible data were obtained on December 8, 1947 at an altitude a little more than 60 km. The evidence of the positive ion current continued to increase with the altitude. The results of the probes have been remarkable. The rockets have reached a maximum altitude of 104 km at a time when the height of E-layer was 110 km. *Subject Headings:* **1. Langmuir probe technique 2. Rocket ionospheric data 3. White Sands, N. M.**—*N.N.*

11D–59 551.510.535:551.510.62:621.396.1

Hosking, R. H. (*Dept. of Physics, Queensland Univ., Brisbane*), **The mean thickness of night-time E_s clouds at Brisbane.** *Australian Journal of Physics*, Melbourne, 19(1):220–221, March **1957.** 3 refs. **DLC**—Measurements of thickness of Esc (Sporadic E clouds) at night by measuring (a) the equivalent paths of echoes from their under surfaces and from the F region, and from internal reflection between the F region and the top of the Esc before returning to the ground, at 2.28 Mc/s at Brisbane for range 0 500 km during 1952, 1953 and 1954 were analyzed and the mean of 98

measurements gave a thickness of 0.33 km with a standard error of 0.23 km. *Subject Headings:* **1. Sporadic E cloud thickness 2. Sporadic E layer (Es) echoes 3. Brisbane, Australia.**—*M.R.*

11D–60 523.75:551.510.535:551.594.12

Hultqvist, Bengt and Ortner, Johannes (*both, Kiruna Geophysical Obs., Sweden*) **Observations of intense ionization of long duration below 50 km altitude after some strong solar flares.** *Nature*, London, 183(4669):1179-1180, April 25, **1959.** fig., 7 refs. **DWB**—On July 7 and Aug. 16, 22 and 26, 1958 very strong absorption was measured with C. G. Little's riometer (relative ionospheric opacity meter) at Kiruna Geophysical Observatory, Sweden. The observation succeeded the outbreak of 3+ solar flares by a few hours. The maximum daytime absorption was >15 db in three of the cases. The results are presented in facsimile riometer recordings and discussed in support of the hypothesis that the ionizing agent was sun-emitted protons from the flares. *Subject Headings:* **1. Solar flare effects on ionosphere 2. D layer ionization 3. Riometer.**—*N.N.* Ⓢ

11D–61 551.594.12:551.510.535

Hultqvist, B. and Ortner, J., **Strongly absorbing layers below 50 km.** *Planetary and Space Science*, N. Y., 1(3):193–204, Aug. **1959.** 8 figs., table, 34 refs., 8 eqs. **DWB**—In a few cases of very strong absorption of very long duration observed at Kiruna Geophysical Observatory during the summer of 1958, the height of the upper boundary of the ionized layer has been found to be about 50 km. It is shown that this height value accords well what is to be expected if the ionizing agent consists of protons. Earlier proposed interpretation is discussed with regard to this new height information. *Subject Headings:* **1. D layer height 2. Ionization by protons.**—*Authors' abstract.* Ⓢ

11D–62 523.75:551.594.12:551.510.535

†Hultqvist, B., **On the interpretation of ionization in the lower ionosphere occurring on both day and night side of the earth within a few hours after some solar flares.** *Tellus*, Stockholm, 11(3):332–343, Aug. **1959.** 9 figs., 3 tables, 23 refs., 6 eqs. **DLC**—At Kiruna Geophysical Observatory there has been a riometer in operation since the end of March 1958. The apparatus, designed by C. G. Little at Geophysical Institute College, Alaska, records the cosmic noise vertical flux on 27.6 Mc/s. On this riometer three solar flares followed by heavy ionospheric absorption (peak value >15 db) have been observed on July 7, Aug. 16 and 26, 1958. The present paper gives a preliminary report of the observed flare effects and proposes an interpretation thereof. The absorption observations have been described and graphically represented. Later, it is shown that the absorption effect can be interpreted as being caused by a high energy ion beam of very small density, emitted from the sun and moving in Störmer orbits. It is suggested, however, that this interpretation should be treated as a working hypothesis until it has been confronted by more complete observational material. *Subject Headings:* **1. Ionization theories 2. Solar flare effects on ionosphere 3. Riometer.**—*I.S.* Ⓢ

11D–63 551.510.535:551.594.12:621.396.1

Huxley, L. G. H. (*Univ. of Adelaide*), **A discussion of the motion in nitrogen of free electrons with small energies with reference to the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(1/2):46–58, Oct. **1959.** 4 tables, 6 refs., 28 eqs. **DWB, DLC**—In this paper measurements of diffusion and drift of slow electrons in pure nitrogen carried out by Crompton and Hall are discussed. The discussion is restricted to the range of energies of the electrons between that of thermal equilibrium and four times that value. From the behavior of the coefficient of diffusion D it is concluded that in elastic collisions between electrons and nitrogen molecules the collisional cross-section A is proportional to the speed c of the electron; namely, $A = 3.29 \times 10^{-23}\, c$ cm². From this result an accurate expression is derivable for the velocity of drift W in terms of the parameter Z/p and the mean energy of agitation of the electron. The measured rate w at which electrons with energy Q lose energy in collisions with molecules is accurately described by a formula that ascribes these losses of energy chiefly to the excitation of changes in the rotational states of the molecules. A formula in close agreement with the measurements is derived for the dependence of the mean energy of agitation of the electrons upon Z/p. The significance of the measurements for ionospheric studies is considered with particular reference to the interpretation of measurements of radio-wave interaction. It is shown that the values of the molecular concentration in the height range 82 to 90 km above the ground, found by means of radio-wave interaction, are consistent with the A.R.D.C. model atmosphere (Minzer and Ripley, 1956). *Subject Headings:* **1. Ionospheric densities 2. ARDC model atmosphere 3. Electron motion in nitrogen.**—*Author's abstract.* Ⓢ

11D–64 551.594.12:551.510.535

†Inoue, Yuji (*Technical Res. Inst., National Defense Agency, Tokyo*), **On the ionization mechanism in the ionosphere.** *Japanese Journal of Geophysics*, Tokyo, 1(3):21–120, March **1957.** 8 figs., 21 tables, 71 refs., 141 eqs. **DWB**—The theories proposed so far on the formation of the ionosphere are criticized. In particular, those on the formation of the E layer are inspected and discussed.

The arguments of criticism are based on rocket measurement data, variations of the ionosphere during solar eclipses, results of recent researches in solar physics, and experimental data about rate of various reactions. It is shown that all the formation theories put forward so far are incomplete. In this paper, a new interpretation of the effective recombination coefficients of an electron in the ionosphere is developed. A new theory for the ionization mechanism in the ionosphere is also brought forward. With respect to the dissipation of electrons it is suggested that an electron is attached to molecular oxygen located at a vibrationally excited level; as a result, a stable negative ion of molecular oxygen is formed; subsequently, a mutual neutralization between this negative ion and a positive ion becomes effective. Attachment processes of a slow electron to molecular oxygen are discussed. A favorable process for stabilization is found. The principal part of positive ion concentrations is of atomic oxygen; the concentration of positive ions of molecular nitrogen is negligible. When a mutual neutralization between a negative ion of molecular oxygen and a positive ion of atomic oxygen takes place, the resulting atomic oxygen is almost all in a highly excited state whose energy is more than 9.11 eV as compared with its ground state. This atomic oxygen gives rise to the emission of photon of its resonance lines as a result of the spontaneous transition from its highly excited state to the ground state. The resonance lines of atomic oxygen are of 1302~1306 Å (OI, $3s^3S^0$–$2p^3P$) and 1025.7 Å (OI, $3d^3D^0$–$2p^3P$). These lines were observed at 115 Km as an emission line by the rocket-borne spectrograph of U. S. Naval Research Laboratory. It appears that these lines are "ionospheric" and "non-solar." The photons of the resonance lines, which appear as a result of the ionospheric recombination, are absorbed by oxygen atoms and the oxygen atoms in the highly excited states are resulted, from which they are ionized with the aid of a visible radiation, being in abundance. The photons of the resonance lines permeate in a scattered radiation down in the E layer, and then they are richly stored up in the E region. The ionization in the F layer is that from the highly excited states of atomic oxygen due to a visible radiation. Such an ionization mechanism explains the variation of the E layer during solar eclipses. With respect to the permeation of the resonance radiations of atomic oxygen, the effects of molecular absorption in the ionosphere are discussed. It is concluded that the incident ionizing radiations come from the chromosphere as well as the corona. *Subject Headings:* **1. Ionosphere formation 2. Ionization theories 3. E layer ionization.**—*Author's abstract.*

11D–65 551.510.535

*Jeffrey, Z. R., **Hourly measurements of ionospheric characteristics, Macquarie Island, 1951.** *Australian National Antarctic Research Expedition, 1947–1949, Interim Reports*, No. 6, **1953.** p. 82–220. Mostly tables. **DLC** (QC973.J4)—Graphs and tables for every month of 1951 for Macquarie Island. *Subject Headings:* **1. Ionospheric characteristics 2. Macquarie Island.**—*M.R.*

11D–66 551.510.535:551.594.12

Johnson, Charles Y. and Heppner, James P., **Daytime measurement of positive and negative ion composition to 131 km by rocket-borne spectrometer.** *Journal of Geophysical Research*, Wash., D. C., 61(3):575, Sept. **1956.** foot-ref. **DLC**—The positive and negative ion composition from 5 to 60 atomic mass units was measured between 93 and 131 km by spectrometers in an aerobee rocket at 10:16 MST, November 1955. No positive ions were detected during this daytime flight. Negative ions were detected as follows:

Atomic Mass No.	46	32	29	22	16
Relative abundance	96	1.6	0.2	1.0	0.7
Probably identification	NO_2^-	O_2^-	?	?	O^-

Positive ions would have been detected if their concentration had been as much as the negative ions of masses 16 and 29. *Subject Headings:* **1. Air-borne spectrometer data 2. Ion composition of upper atmosphere 3. Rocket measurements.**—*S. Fritz.*

11D–67 551.510.535:551.594.12

Kallmann, H. Korf (*Univ. of California, Los Angeles*), **Un nouveau modèle d'ionosphère.** [New model of the ionosphere.] *La Météorologie*, Paris, Ser. 4, No. 52:235–243, Oct./Dec. **1958.** 7 figs. English and Spanish summaries p. 236. **DWB**—After showing the reason for the considerable differences between the constitution of the ionosphere as given by experiments of radio-wave reflection at different frequencies and as given by recordings made with rockets fired to a high altitude, the author explains that the Chapman theory, used up to the present under a simplified form, must not be blamed. In fact, thanks to the recent data supplied by rockets, it can account for the structure of the ionosphere. Results thus given are so satisfactory that although numerous uncertainties exist, it offers a new image of the ionosphere; it is not composed of ionized layers but rather of a very thick, strongly ionized region with weak variations of electron densities. *Subject Headings:* **1. Ionospheric models 2. Chapman theory 3. Ionospheric electron density.**—*Author's abstract.*

11D–68 551.510.535:551.594.12:550.385.36

Kamiyama, Hiroshi (*Geophysical Inst., Tohoku Univ.*), **Ionospheric changes associated with geomagnetic bays.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 7(3):125–135, March **1956.** 4 figs., 3 tables, 18 refs., 14 eqs. **DWB, DLC**—It is assumed that the ionospheric currents corresponding to geomagnetic bay disturbances in the temperate latitude are produced by the electrostatical field developed by the current system in the auroral zone. Taking into account the ionization drift due to this electric field and the earth's magnetic field, the deviation in the electron density from its normal condition is examined. The depression of the electron density in the ascending ionospheric region and the ionic concentration in the descending region, which we often notice during magnetic disturbances, are explainable by assuming a height gradient of temperature in the upper atmosphere. *Subject Headings:* **1. Ionospheric currents 2. Geomagnetic bays 3. Ionospheric electron density.**—*Author's abstract.*

11D–69 551.510.535

Kamiyama, H. and Sato, Teruyuki (*both, Geophysical Inst., Tohoku Univ.*), **The latitudinal effect on the disturbance daily variation in F_2 layer of the ionosphere.** *Tohoku Univ., Science Reports, 5th Series, Geophysics*, 8(1):41–51, Nov. **1956.** 3 figs., 2 tables, 7 refs., eq. **DWB, DLC**—The so-called $S_D(N_m)$ in the F2 region of the ionosphere are expressed by Fourier series; it is found that the amplitudes are controlled by the geomagnetic latitude and the phases are depending on the geographic latitude. The latitude distributions of the harmonic coefficients show marked seasonal changes. In equinoctial months the distributions are almost symmetrical about the equator, but in solstitial months, the axes of symmetry are removed towards the winter hemisphere. Equal deviation charts for different seasons are given. *Subject Headings:* **1. F2 layer variations 2. Ionospheric disturbances 3. Latitude ionospheric variations.**—*Authors' abstract.*

11D–70 551.510.535(52)

Kasuya, Isao (*Radio Res. Labs., Tokyo*), **On the occurrence of the F1½-layer at Tokyo.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):126–129, Sept. **1959.** 2 figs., 3 refs. **DLC**—From a statistical analysis based on routine ionospheric observations at Tokyo (Kokubunji) throughout the last solar cycle, it is found that annual, seasonal and diurnal variations exist in the frequency of occurrence of the intermediate layer, the F1½-layer at the middle latitude of Tokyo. The F1½-layer appears mostly in the daytime and is prevalent at both equinoxes, especially remarkable in late spring during years of high solar activity—there has been good correlation between the frequency of occurrence and the number of sunspots. *Subject Headings:* **1. F1½ layer 2. Tokyo, Japan.**—*Author's abstract.* Ⓢ

11D–71 551.510.535:551.501.8

Khastgir, S. R. and Murth, Y. S. N. (*both, Dept. of Pure Physics, Univ. College of Science, Calcutta*), **Left-handed ionospheric echo from an equivalent height of (E+F).** *Journal of Scientific and Industrial Research, Sec. B*, New Delhi, 18(7):304–305, July **1959.** 3 refs. **DWB, DLC**—This report reviews the investigations made by SATYANARAYANA, BAYHRU and KHASTGIR on the left-hand M echoes as reported in this Journal (**1956**). It also reviews briefly the right-handed extraordinary M echoes observed by RATCLIFFE and WHITE as reported in the *Philo. Mag.*, (**1933**). It presents an explanation of the basic fundamentals about these echoes observed from equivalent heights, with or without the E_s echo, and describes conditions under which the partial reflection and transmission of such echoes may occur. The rare occurrence of these echoes is due to the off-chance of ion clouds or patches of increased ionization coming in the path of the upgoing wave reflected from the ground after one reflection from the F region. *Subject Headings:* **1. Ionospheric echoes 2. Sporadic E layer (Es).**—*N.N.* Ⓢ

11D–72 551.510.535:539.17

Kimpara, Atsushi (*Nagoya Univ., Japan*), **Perturbations ionosphériques à début brusque causées par une explosion atomique.** [Sudden ionospheric disturbances caused by atomic explosions.] *Académie des Sciences, Paris, Comptes Rendus*, 248(14):2117–2119, April 6, **1959.** fig., 2 refs. **DWB, DLC**—At the time of a nuclear explosion at high altitude, meteorological conditions made it possible to observe a strengthening of sferics due to a sudden ionospheric disturbance. The recording of the sferics was done on 10, 21 and 27 kc/s. Comments on the observations. *Subject Headings:* **1. Ionospheric disturbances 2. Sferics 3. Atomic explosion effects on ionosphere 4. Toyokawa, Japan.**—*A.V.* Ⓢ

11D–73 523.753:551.510.535:550.388

Koeckelenbergh, A., **L'éruption chromosphérique du 9 avril 1956 et ses phénomènes associés.** [The chromospheric eruption of April 9, 1956, and its associated phenomena.] *Ciel et Terre*, Brussels, 75(1–2):28–33, Jan./Feb. **1959.** 2 figs., 2 pl., 6 refs. **DLC**—On April 9, 1956, a particularly

intense chromospheric eruption was observed at the Royal Observatory of Belgium. A solar radio jump on 169 Mhz was recorded at the same time, at the radio-astronomical station at Humain-Rochefort (Belgium) and a practically general disturbance was noted on short waves. The author gives the observation conditions, the optical data and the radioelectric observations made on 169 Mhz as concerns this phenomenon. He examines the ionospheric effects and the geomagnetic effects and compares the data gathered. The ionospheric disturbance was preceded by optical, geomagnetic and radioelectric phenomena on meter waves. It began at the moment of the maximum emission on the Hα-line. It is probably connected with a simultaneous reinforcement of this line and of the ultraviolet Lα-line of the solar radiation. *Subject Headings:* **1. Chromospheric eruptions 2. Solar-ionospheric relationships 3. Solar-geomagnetic relationships 4. Uccle, Belgium.**—*A.V.* Ⓢ

11D–74 551.510.535

Kotadia, K. M. (*Physical Res. Lab., Ahmedabad*), **The ionospheric F2 layer over Ahmedabad, Delhi & Tiruchirapalli during the sunspot minimum period 1953–54.** *Journal of Scientific and Industrial Research, Sec. A*, 15(12):543–550, Dec. **1956.** 8 figs., 14 refs. **DWB, DLC**—F2 layer over Ahmedabad, South Asia, is compared with that of other geomagnetic latitudes in Africa and southeast Asia. Data are presented on F2 layer variation at sunrise and sunset during the summer and the winter months as well as the diurnal variations during the equinoxes. *Subject Headings:* **1. F2 layer variations 2. Ahmedabad, India.**—*N.N.*

11D–75 5515.10.535:551.507.362.2

Kraus, Lester and Watson, Kenneth M., **Plasma motions induced by satellites in the ionosphere.** *Physics of Fluids*, N. Y., 1(6):480–488, Nov./Dec. **1958. DWB**—The electrohydrodynamic phenomena associated with the high-velocity motion of a charged body in a plasma are investigated with a view to applications to satellite motion in the ionosphere. It is shown that the effect of the electric field due to the charge on the body in inducing collective motion leads to similar results for both high- and low-density gases. By using a linearized theory, formulas are obtained for the electrohydrodynamic drag and for the increased ionization in the Mach cone behind the body. *Subject Headings:* **1. Ionization by satellites 2. Electrohydrodynamic drag of satellites.**—*Author's abstract.*

11D–76 523.164.32:551.510.5355

†Kundu, Mukul Ranjan, **Structures et propriétés des sources d'activité solaire sur ondes centimétriques.** [Structures and properties of solar activity sources on centimeter waves.] *Annales d'Astrophysique*, Paris, 22(1):1–100, Jan./Feb. **1959.** Numerous figs., tables, eqs., 41 refs. French, English and Russian summaries p. 1. **DWB, DLC**—A two-antenna interferometer has been constructed for the study of localized sources on the sun (persistent sources and bursts) on centimeter waves (3,23 cm). The two antennas are in equatorial mounting and are placed on an E-W base line at a distance of 60 m from each other. The variation of the resolving power due to the diurnal motion is utilized to measure the dimensions and distribution of brightness of these sources. Observations with this instrument have brought new evidence on several properties of these sources: evolution, apparent diameter, polarization, etc., which clarify considerably their classification and give new clues to their interpretations and their association with the corresponding phenomena observed in optics and on decimeter and meter waves. We have also been able to show an extremely close relationship between the ionization of the E-layer of the ionosphere and 10–7 cm solar radiation. *Subject Headings:* **1. Interferometers 2. Solar radio emission 3. Solar-ionospheric relationships 4. E layer ionization.**—*Author's abstract.* Ⓢ

11D–77 551.510.535(08)

Landmark, B. (*ed.*), **Papers presented at the Ionospheric Research Meeting AGARD Avionics Panel, Cambridge, England.** *AGARDograph*, Paris, No. 34, Sept. **1958.** 204 p. figs., photos, tables, refs., eqs., throughout. Pertinent articles abstracted separately. At head of t-p.: North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development (AGARD). **DWB** (629.1323 N864a)—A collection of 16 papers dealing with different aspects of sporadic E ionization presented at the meeting and the introductory and final remarks by J. A. Ratcliffe of Cavendish Laboratory, Cambridge, Eng. The papers are arranged here in six parts with a summary discussion at the end of each part. In his initial remarks J. A. Ratcliffe emphasized the general need for clarity in the discussions. For this purpose he expressly suggested to use classification only to simplify, to discuss theories which can be tested experimentally, and not to pay too much attention to the precise shape of the E-layer. In his final remarks he highlighted the main points which arose during discussions. *Subject Headings:* **1. Ionospheric symposia 2. Sporadic E layer (Es).**—*I.S.*

11D–78 551.510.535:523.75:621.396

Kauter, E. and Sprenger, K., **Eine einfache Methode zur Erfassung von Sonneneruptionseffekten in der tiefen Ionosphäre.** [Simple method for recording solar flare effects in the lower iono-

phere.] *Zeitschrift für Meteorologie*, Berlin, 12(7):205–210, **1958.** 10 figs., 3 refs. English summary p. 205. **DWB, DLC**—Field strength records from long wave transmitters (150–300 kc) over great distances (1300 km) indicate particularly marked sudden field anomalies (SFA) during solar flare effects. The character of intensity variations can usually be derived from a normal type which can be interpreted as a change on phase between ground and sky wave superimposed by reflection coefficient variations occurring during this effect. The very marked form of SFA in this frequency range, present also during small and weak effects, and the possibility of an exact timing in the beginning and the maximum of the effect in nearly all cases recommend this method as an ideal ionospheric patrol for solar flare effects. *Subject Headings:* **1. Solar flare effects on ionosphere 2. Radio field strength anomalies.**—*Authors' abstract.*

11D–79 551.510.535:551.557

Lepechinsky, D. (*Lab. Nat'l. Radioélectricité, Paris*), **De l'origine des échos E sporadique: quelques données expérimentales recueillies en France.** [On the origin of sporadic E echoes: some experimental data obtained in France.] *AGARDograph*, Paris, No. 34:97–107, Sept. **1958.** fig., table, 10 refs. French summary p. 97. English summary p. 108–109. **DWB** (629.1323 N864a)—Some experimental data gathered in France are cited as confirming Gallet's "dynamic" theory of the sporadic echo phenomenon. The correlation observed between the variability of ionospheric winds and the occurrence of transparent Es echoes as well as the obvious lack of correlation between the Es recorded simultaneously at Bagneux and Poitiers during the 12 months of 1957 support the hypothesis of purely dynamic origin of Es echoes. Accordingly, the Es echoes arise from the turbulence of ionization at high altitudes rather than from a particular ionizing agent. The most frequently observed types of Es in the 10 ionospheric sounding stations attached to the C.N.E.T. are also tabulated. *Subject Headings:* **1. Sporadic E layer (Es) theories 2. France.**—*I.S.*

11D–80 550.388:551.510.535

Lewis, R. P. Waldo and McIntosh, D. H. (*Met. Office, Edinburg*), **Geomagnetic and ionospheric relationship.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(1/2):44–52, **1953.** 8 figs., 5 refs. **DWB**—The effect of magnetic "disturbance" on various parameters, both geomagnetic (measured at Eskdalemuir) and ionospheric (measured at Slough), is investigated by choosing days on which the K_p sum is markedly above or below those of adjacent days. Most of the parameters show a peak or trough corresponding to that of disturbance, and following it by periods of from 0 to 18 hrs. An extension of the investigation to measurements made at Huancayo shows mainly similar results. Particular attention is called to some peculiar seasonal effects; also to features of the sporadic E layer occurrence at Slough and of the vertical movement. *Subject Headings:* **1. Geomagnetic-ionospheric relationships 2. Sporadic E layer (Es) 3. Great Britain.**—*Author's abstract.*

11D–81 551.510.535:551.506.22

Liakhov, B. (*Res. Inst. of Geomagnetism, Ionos. and Radio Propagation, U.S.S.R.*), **Work done according to IGY programme.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 10(1):67–68, Jan. **1959. DWB, DLC**—During the IGY, the Research Institute of Geomagnetism, Ionosphere and Radio Propagation of the U.S.S.R. Ministry of Communications, the Radio Engineering and Electronics Institute of the U.S.S.R. Academy of Sciences and other research bodies have studied the structure of the ionosphere, made significant calculations by large electronic computing machines, analyzed the moments of the appearance and disappearance of the radio signals from the outer ionosphere, as well as that of the concentrated electrons at altitudes of 600–700 km. It is concluded that the limit of the atmosphere is at 2000–3000 km. There has been an abundant exchange of scientific materials on solar activity, the ionosphere and the condition of earth's magnetic field which has proven of value for short-range magnetic and ionospheric forecasting. The Soviet also established a magnetoionospheric station at the pole of homogeneous magnetization at station Vostok in the Antarctica (lat. 78.5°S; long. 111°E) at an altitude of over 3800 m, nearly 1500 km from the coast. *Subject Headings:* **1. IGY ionosphere program 2. Soviet participation in IGY.** —*N.N.* Ⓢ

11D–82 551.510.535:519.2

Longuet-Higgins, M. S., **A statistical distribution arising in the study of the ionosphere.** *Physical Society of London, Proceedings, Ser. B*, 70:559–565, **1957.** 2 refs., 27 eqs. **DLC.** Reprinted in *National Institute of Oceanography, Wormley, England, Collected Reprints*, 5(200), **1957.**—In connection with the analysis of fading patterns of radio waves reflected from the ionosphere, an approximate distribution is deduced for the directions of the "lines of maxima" on a random surface. The theoretical distribution is found to be in good agreement with some experimental results obtained previously by Briggs and Page. *Subject Heading:* **1. Statistical analysis of ionosphere.**—*Author's abstract.*

11D–83 551.510.535:550.38

Lyon, A. J.; Skinner, N. J. (*both, Univ. College, Ibadan, Nigeria*) and Wright, R. W. (*Univ. College of Ghana*), **Equatorial spread-F and magnetic activity.** *Nature*, London, 181(4625):1724–1725, June 21, **1958.** 2 figs., 2 refs. **DWB**—The annual variation of the percentage occurrence of spread-F at Ibadan, Nigeria (lat. 7.5°N) during the international quiet and disturbed days of 1953 and 1957 is discussed. Ionospheric spread-F is very common and the inverse correlation during the winter months is outstanding between equatorial spread-F and magnetic activity in the years of sunspot minimum. *Subject Headings:* **1. Spread F variations 2. Magnetic effects on ionosphere 3. Ibadan, Nigeria.**—*N.N.*

11D–84 551.510.535:551.590.2

†McElhinny, M. W. (*Dept. physics, Univ. Coll. Rhodesia & Nyasaland, Salisbury, So. Rhodesia*), **Some further analyses of E-layer measurements in South Africa during the solar eclipse of Dec. 25, 1954.** *Journal of Atmospheric and Terrestrial Physics*, New York, 14(3/4):273–286, June **1959.** 6 figs., 3 tables, 22 refs., 10 eqs. **DWB, DLC**—The E layer measurements from three stations in South Africa during the solar eclipse of Dec. 25, 1954 have been analyzed from three points of view: (a) all the radiation comes from the visible disc, in which case $a'E = 1.5 \times 10^{-8}$ cm^3 sec^{-1}; (b) 15% of the radiation comes from outside the disc and $a'E = 4 \times 10^{-8}$ cm^3 sec^{-1}; and (c) the effect of two species of ion with differing recombination coefficients. It is shown that to neglect the effect of a more rapidly recombining species of ion may lead to an overestimate of the effect of the corona or of the limb-brightening. *Subject Headings:* **1. E layer recombination 2. Eclipse effects on ionospheric layers.**—*Author's abstract.* Ⓢ

11D–85 551.510.535

McNicol, R. W. E. and Bowman, G. G., **Latitude variations of frequency of occurrence of "Spread-F" satellite traces.** *Australian Journal of Physics*, Melbourne, 10(4):588–590, Dec. **1957.** 1 fig. **DLC**—A brief report on a study of the relative frequency with respect to latitude of Spread-F "satellite" traces on ionograms for 1956 for stations in the northern hemisphere up to 50°N, and for 1952 for the Southern Hemisphere as far south as Hobart, Tasmania. When plotted as a function of geographic latitude an irregular distribution was obtained, but as a function of geomagnetic latitude a smooth though skewed, distribution was obtained. No significant difference was found between summer and winter. These Spread-F satellites are most frequent between 20° and 45° geomagnetic latitude (where dip is 40°–70°), and is almost nonexistent at very low latitudes, and at geomagnetic latitudes near 50°. *Subject Headings:* **1. Spread F satellite variations 2. Latitude variations in spread-F 3. Ionospheric geomagnetic latitude variations 4. Geomagnetic latitude effects.**—*M.R.*

11D–86 551.510.535 551.590.22:550.384.3

Maeda, Hiroshi, **On the disturbance daily variations and the lunar daily variations in the F2 region of the ionosphere on the magnetic equator.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 7(3):75–85, Sept. **1955.** 14 figs., 5 tables, 12 refs. **DLC**—The author examines the direct effects of the vertical electron drift due to the electric fields accompanied by electric currents producing the observed geomagnetic S_D and L variations, upon the F2 region of the ionosphere at the magnetic equator. It is shown that the calculated results may explain the main features of the observed disturbance daily variations ($S_D(F2)$) and of the observed lunar daily variations (L(F2)) in the F2 region. *Subject Headings:* **1. Lunar diurnal magnetic variations 2. F2 layer variations 3. Ionospheric electron drift.**—*Author's abstract.*

11D–87 550.385:551.510.535

†Maeda, K. I. and Sato, T., **The F region during magnetic storms.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):232–239, Feb. **1959.** 8 figs., 30 refs., 6 eqs. **DLC**—The results are described of statistical investigations made in the F region during magnetic storms. The characteristics of the daily variation of the deviation from the mean critical frequency and of the height of the maximum electron density, $\Delta foF2$ and $\Delta hpF2$, respectively, are shown over the wide range of latitude from the equator to the auroral zone and for the principal seasons of the year. After a brief survey of theories to interpret the observed results, it is shown that the ionization-drift theory, which is associated with the dynamo theory, is almost satisfactory for the consistent interpretation of the various facts observed. *Subject Headings:*: **1. Magnetic effects on ionosphere 2. Dynamo-theory of ionosphere.**—*Authors' summary.* Ⓢ

11D–88 551.510.535

Marasigan, V. (*Manila Obs., Philippines*), **Bifurcations in the F-region at Baguio, 1952–1957.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):26–31, Dec. **1958.** 5 figs., 13 refs., eqs. **DLC**—A 5-year statistical survey of bifurcations in the F region at Baguio is presented and analyzed in the light of a parametric mechanism of the v-R relations of the F1 and F2 layers. The

nclusion is reached that two of the features of bifurcation statistics are mainly due to variations layer heights and thicknesses with season and solar activity respectively. *Subject Headings:* **F layer bifurcation 2. Baguio, Philippines.**—*Author's abstract.*

11D–89 551.510.535:551.594.13

Marasigan, V., **Height-gradient of electron-loss in the F-region.** *Journal of Atmospheric and errestrial Physics*, London. 13(1/2):107–112, Dec. **1958.** 4 figs., 14 refs., 6 eqs. **DLC**—A theoretal expression is derived for the exponential height-gradient of the coefficient of electron-loss in the region, on the assumption that this gradient completely accounts for the initial process of bercation. Five models are proposed: parabolic, linear, second-power, cosine and quasi-parabolic. *ubject Headings:* **1. F layer bifurcation 2. Ionospheric electron diffusion.**—*Author's abstract.*

11D–90 551.510.535

Marasigan, V., **Single and double inflexions on the F-trace.** *Journal of Atmospheric and errestrial Physics*, N. Y., 16(1/2):193–196, Oct. **1959.** 2 figs., 12 refs., 5 eqs. **DWB, DLC**—An tempt is made to explain the single and double inflexions on the daylight F trace in terms of the ppleton-Lyon theory of the "height-lag." Two hypothetical models are presented. A procedure r empirically verifying and evaluating either hypothesis is indicated. *Subject Heading:* **1. F layer ifurcation.**—*Author's abstract.* Ⓢ

11D–91 551.510.535:551.594.13:551.590.21

†Mariani, F. (*Ist. Naz. Geofisica, Rome & Ist. Fisica Univ., Rome*), **The worldwide distribution f the F2 layer electron density: seasonal and non-seasonal variations and correlations with solar ctivity.** *Nuovo Cimento*, Bologna, Ser. 10, 12(3):218–250, May 1, **1959.** 8 figs., 4 tables, 19 refs., eqs. Italian summary p. 240. **DLC**—The worldwide behavior of the twelve-month period seasonal and nonseasonal) variation of the maximum electron density N in the F2 layer appears oticeably different at noon and at midnight. In each case, it is controlled by the geomagnetic eld and by the solar activity but, while it shows large asymmetric features at noon in the two emispheres, it is fairly symmetrical at midnight. It is not possible to account for the experimental esults by assuming some external source of radiation producing nonseasonal effects. One is led o assume some terrestrial cause of asymmetry: for example, some effect of general circulation in the pper atmosphere. With respect to the correlation of electron density with solar activity, there ppears again some noticeable asymmetry in the two hemispheres; in particular, the Northern emisphere appears more influenced by the solar hydrogen filaments, especially for increasing latiude. The explanation of these asymmetries, in terms of some direct influence of the sun, is also uzzling, so that, in this case, one is led to think of some more or less unknown effect of solar corscular (or electromagnetic) radiation on the upper atmosphere, for example on its movements or s conductivity. At the present stage of our knowledge, we cannot exclude the possibility of a imilar cause for both the asymmetries of the twelve-month period variation and of the correlations vith solar activity. Further observational evidence is required. *Subject Headings:* **1. Electron ensity in F2 region 2. Ionospheric electron density distribution 3. Solar-ionospheric relationships.** —*Author's abstract.* Ⓢ

11D–92 551.510.535

†Mariani, F., **A new theoretical model of the composite F-layer.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):160–173, Oct. **1959.** 8 figs., 2 tables, 23 refs., 8 eqs. **DWB, DLC**—A model of a composite F layer is developed to explain both the regular behavior of the F1 layer and the anomalies of the F2 layer. The bifurcation in the F1 and F2 layers arises as an effect of a discontinuity in the physical conditions of the upper atmosphere, namely a fairly rapid variation of the temperature vertical gradient. The assumed height variation of the generalized recombination coefficient is $\alpha = \alpha_0 n \xi N^{-1} T^{-1}$. Tidal movements have a smaller importance, because they cause only secondary perturbative effects. *Subject Headings:* **1. F layer bifurcation 2. Ionospheric tides.**—*Author's abstract.* Ⓢ

11D–93 551.510.535:551.590.21

†Martyn, D. F., **The normal F region of the ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):147–155, Feb. **1959.** 6 figs., 37 refs., 13 eqs. **DLC**—The global morphologies of the F1 and F2 regions at magnetically quiet times are reviewed, and attention also is given to the sunspot cycle variations. The physical conditions, temperature, pressure, recombination coefficients, and collision frequencies are reassessed in the light of recent studies of rocket and satellite results and of diffusion. The theory of the F region is reviewed with special attention to Bradbury's hypothesis and to the effects of transport of ionization. Also considered are the morphology of "spread-F" and radio star scintillation phenomena. A theory of the latter is outlined, and it is shown that the undersurface of the F region is unstable at times of upward drift, which appear to

be the times when such phenomena are prominent. *Subject Headings:* **1. F layer 2. Solar-ion spheric relationships 2. Spread F 3. Radio star scintillation.**—*Author's summary.* Ⓢ

11D–94 551.510.55

Mason, Ruth F. (*Geophysical Obs., Christchurch, New Zealand*), **Some observations on nigh time ionospheric storms at Christchurch.** *New Zealand Journal of Geology and Geophysics*, Wellin ton, 1(3):519–529, Aug. **1958.** 6 figs., 6 tables, 4 refs. Abstracted from reprint. **DWB** (M:538 M411so)—Data from ionograms are discussed in relation to the description of nighttime storms Christchurch. A consideration of seasonal variation shows that in winter, storms have features n noticeable in other seasons. Electron distributions are calculated for the early hours of both seve and moderate storms; all show an initial increase in the number of electrons up to maximum densi level prior to the storm decrease normal for this latitude. *Subject Headings:* **1. Nocturnal ionospher storms 2. Christchurch, New Zealand.**—*Author's abstract.*

11D–95 551.510.535:551.594.2

Matsushita, Sadami. **Sequential Es and lunar effects on the equatorial Es.** *Journal of Ge magnetism and Geoelectricity*, Kyoto, Japan, 7(3):91–95, Sept. **1955.** 4 figs., 10 refs. **DLC**—S quential Es is a type of sporadic E layer ionization which shows apparent vertical movement. Di tribution of this phenomenon in space and time is analyzed from world-wide ionospheric dat Lunar effects on Es and Sequential Es are shown. *Subject Headings:* **1. Sequential Es 2. Luna effects on equatorial Es.**—*G.T.*

11D–96 551.510.535:551.594.1

†Matsushita, S. (*High Altitude Obs., Univ. of Colorado*), **A study of the morphology of ionospheri storms.** *Journal of Geophysical Research*, Wash., D. C., 64(3):305–321, March **1959.** 6 figs 6 tables, 31 refs., 2 eqs. **DLC**—A study was made of the variations of the maximum electron densit in the ionospheric F2 layer during magnetic storms. Fifty-one strong storms and 58 weak storm were studied. The data were collected during the ten-year period 1946–1955, at 38 ionospheri stations between 60.4°N and 60.4°S geomagnetic latitudes. The ionospheric stations were put int eight zones according to their geomagnetic latitudes. Storm-time variations in the maximu electron number density (Dst) and disturbance daily variations during each six-hour period (DS were obtained for each of the eight zones. The Dst variation in higher middle-latitudes was cha acterized by an initial short increase followed by a much larger decrease, the amplitude of the decreas being accentuated in summer. In the equatorial region, however, the phase of the variation wa the opposite of that in higher latitudes. There was generally an increase after an initial shor decrease, with no seasonal effect. The Dst variation at intermediate latitudes resembled that a higher latitudes in summer and that at the equatorial region in winter, with the average over a seasons being relatively flat. The diurnal component of the DS variation for each six-hour perio indicated, on the harmonic dial, a change in the clockwise sense except in the equatorial regio The maximum amplitude of the diurnal component of the mean of the DS variations showed gradual decrease from higher toward lower latitudes, with a subsequent increase in the equatoria region. A remarkable change on the phase of the diurnal component also occurred from highe toward lower latitudes. *Subject Headings:* **1. Ionospheric storms 2. Ionospheric electron densit variations.**—*Author's abstract.* Ⓢ

11D–97 662.2:539.1:551.510.535:550.38

Matsushita, S., **On the artificial geomagnetic and ionospheric storms associated with high altitude explosions.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1149–1161, Sept. **1959** 10 figs., table, 14 refs. **DLC**—Geophysical effects of nuclear explosions at Johnston Island on Aug 1 and 12, 1958, were studied by means of IGY geomagnetic and ionospheric data collected at variou stations in the Pacific area and the American continent. The explosion heights are estimated at 7 to 80 km and about 40 km, respectively. Immediately after each explosion, three phenomen occurred. (1) Strong counterclockwise circular electric currents were formed in the vicinity o Johnston Island at 80–100 km height. They caused the immediate occurrence of artificial magneti storms in the central Pacific. (2) High-energy particles moving along the magnetic lines of forc caused auroras seen from Apia, and also caused the main parts of the magnetic storms observed a Apia. (3) X-rays due to the explosion caused the increase of the D-region absorption observed a Maui. Irregularities of the electron density in the F layer at Maui and the maximum geomagneti change at Honolulu were caused by a shock wave from the explosion. The degree of ionization in wide area in the central Pacific increased to about 10 times normal within 35 min after the firs explosion and within about 6 hr after the second. Then a strong radio adsorption continued fo many hours. *Subject Headings:* **1. Nuclear explosion effects on ionosphere 2. Nuclear explosio effects on geomagnetism 3. Johnston Island.**—*Author's abstract.* Ⓢ

11D–98 551.507.362.1:551.510.535:551.594.12

Mikhnevich, V. V., **Nekotorye rezul'taty issledovaniĭ verkhneĭ atmosfery.** [Some results of investigations of the upper atmosphere.] *Priroda*, No. 5:71–72, **1958. DWB, DLC**—The data obtained by a rocket flight, up to a height of 473 km and with a payload of 1520 kg, which took place on Feb. 21, 1958 in the U.S.S.R. is summarized. Measurements of electron concentration in the upper ionosphere showed that there is no sharply marked ionospheric layer at 110–120 km. The electron concentration above 110–120 km diminished slightly and increased gradually up to 250 to 300 km. Above this level at about 300 km the concentration of electrons diminishes slowly so that at 470 km the electron concentration is equal to one million of electrons per cubic centimeter. The existence of a large concentration of electrons at 400–500 km, where the concentration of neutral particles is greater than that of electrons, may be explained by the intense diffusion of electrons from the lower lying regions of the ionosphere. Also it was established that at 100 km there is separation due to diffusion. Collisions between particles at heights up to 300 km were recorded. The greatest height up to which pressure was measured—260 km—was attained during rocket investigation in the U.S.S.R. *Subject Headings:* **1. Rocket ionospheric data 2. Ionospheric electron density distribution 3. Soviet rocket measurements 4. U.S.S.R.**—*I.L.D.*

11D–99 523.74:551.510.535:551.594.12

Minnis, C. M. and Bazzard, G. H. (*both, DSIR Radio Res. Station, Slough*), **A daily index of solar activity based on E-layer ionization (July 1957–Dec. 1958).** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):57–64, Dec. **1959.** 3 tables, 9 refs., 8 eqs. **DWB, DLC**—The density in a Chapman layer can be related to the intensity of the incident solar ionizing radiation. This relation has been adopted as the basis for computing a daily index of the radiation intensity using the critical frequency of the E layer at Slough. Precautions have been taken to minimize errors due to irregularities in the behaviour of the layer and to the difficulty in identifying the E layer trace. The standard deviation of the residual errors in the index is estimated to be 2%. The index has been tabulated for the period 1 July 1957 to 31 Dec. 1958. *Subject Headings:* **1. Solar activity indices 2. Solar-ionospheric relationships 3. E-layer ionization.**—*Authors' abstract.* Ⓢ

11D–100 523.75:551.510.535:551.594.13:550.388

†Mitra, A. P. and Jones, R. E. (*both, Penna State College, Ionosphere Research Lab.*), **Determination of the location of the ionospheric current system responsible for geomagnetic effects of solar flares.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(4/5):141–147, **1953.** 2 figs., 2 tables, 23 refs., 2 eqs. **DWB**—A new method for locating the ionospheric current system associated with solar flares is presented. The method depends on the time of maximum intensity of a geomagnetic flare effect and the enhancement of electron density at the relevant level. It is found that the flare current system is located either at 100–130 km (if one assumes that the flare effect is essentially one of enhancement of the *Sq*-current) or at 60 km (if it is an independent system). *Subject Headings:* **1. Ionospheric currents 2. Solar flare effects on geomagnetism.**—*Authors' abstract.*

11D–101 551.510.535:523.75

†Mitra, A. P., **Ionospheric effects of solar flares, Pt. 1, Evaluation of experimental data.** Penn. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-3875, Scientific Report No. 112, Oct. 15, **1958.** 57 p. 23 figs., 7 tables, 26 refs., 42 eqs. (Pt. 2, in *Sci. Report*, No. 113.) **DWB**—This is the first of a series of reports dealing with the ionospheric effects of solar flares. The present work describes the various radio and magnetic data and deals with initial methods of analysis. These include long and short radio wave absorption, change in phase height and, to a lesser extent, group height measurements. Magnetic crochets are also treated from the viewpoint of the current systems by which they are produced. *Subject Heading:* **1. Solar flare effects on ionosphere.**—*Author's abstract.*

11D–102 551.510.535

†Mitra, A. P., **Relaxation time of the ionosphere.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-3875, Scientific Report, No. 119, April 1, **1959.** 35 p. 13 figs., 3 tables, 17 refs., 33 eqs. **DWB** (M10.535.P415i)—A generalized study of relaxation time phenomenon comprises the subject of interest of this report. A new model, based on extensive experimental data, is deduced and is related to the physical considerations involved. Temporal and latitudinal variations are included in this study to the extent possible. The report is concluded with a discussion concerning several related phenomena. *Subject Heading:* **1. Ionospheric relaxation time.**—*Author's abstract.* Ⓢ

11D–103 551.510.535:551.594.12 551.510.535:523.74

Mogilevskiĭ, E. I., **Uravnenie kvazistatsionarnogo ionizatsionnogo ravnovesiia v oblasti F2 i korpuskuliarnoe izluchesnie Solntsa.** [Equation of the quasi-stationary ionization equilibrium in

the F2 region and solar corpuscular radiation.] (In: Akademiia Nauk SSSR. Komissiia po Issl vaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhni atmosferu Zemli.** Moscow, **1957.** p. 261–268. 43 eqs.) **DLC** (QB531.A5)—A detailed qu tative model is developed to explain the ionization in F2 layer produced by corpuscular radiat from the sun, especially during disturbed conditions in the geomagnetic field and in the ionospl in middle and high latitudes, or during aurorae. *Subject Headings:* **1. Corpuscular ionization of layer 2. Solar-ionospheric relationships.**—*M.R.*

11D–104 551.510.535:523.

Munro, G. H., **Travelling disturbances in the ionosphere: changes in diurnal variation.** *Nat.* London, 180(4597):1252–1253, Dec. 7, **1957.** fig., ref. **DWB**—From 1949 to 1957 diurnal va tions in the direction of horizontal movements of ionospheric disturbances in summer were found show different patterns from year to year (comparative curves Jan. 1951–54 and 1957). It thought likely that the changes (e.g., a marked shift of direction from SE to SW about midday 1956 and 1957) are associated with the sunspot cycle. *Subject Headings:* **1. Diurnal ionosphe variations 2. Ionospheric disturbances 3. Sunspot effects on ionosphere.**—*G.T.*

11D–105 551.510.535:551.594.12:550.385:551.

†Noonkester, V. R., **Proposed investigation of ionospheric electron density profile and g magnetic fluctuations as a function of stratospheric winds.** *U. S. Navy Electronics Lab., San Die Calif., Research and Development Report NEL/Report* 908, June 5, **1959.** 16 p. 2 figs., 72 re 16 eqs. **DWB** (M(055) U585r)—More detailed studies are needed to determine the relations between ionospheric and lower atmospheric conditions. According to the dynamic theory ionospheric electrical currents, the electron density profile and magnetic variations at the surf of the earth are functions of the E layer wind and conductivity distribution. This is illustra mathematically in this report. It is concluded that if significant relationships between ionosphe conditions and lower atmospheric circulation can be found, their applications to low-frequency ra propagation problems will be of great value. *Subject Heading:* **1. Stratosphere-ionosphere int action.**—*Author's summary & N.N.* Ⓢ

11D–106 551.510.5

North Atlantic Treaty Organization. Advisory Group for Aeronautical Research and Develo ment, **Abstracts of lectures at AGARD Symposium on Polar Atmosphere, Oslo, July 2 8, 19 (Ionospheric part).** issued **1956.** Each abstract repaged. foot-refs. Tipped in: [Program] the Symposium. **DWB** (M10.535 N864s)—A mimeographed collection of abstracts or summar of 21 papers on ionosphere and related problems as presented at the (Oslo) AGARD symposium the Polar atmosphere. *Subject Headings:* **1. Ionosphere symposia abstracts 2. Polar atmosphe conferences 3. Oslo, Norway.**—*M.R.*

11D–107 551.510.535:550.3

Obayashi, Tatsuzo, **On the world-wide disturbance in F_2-region.** *Journal of Geomagneti and Geoelectricity*, Kyoto, 6(2):57–67, June **1954.** 20 figs., 2 tables, 11 refs. **DLC**—World-wi patterns of F2 region disturbance and their development with geomagnetic storm-time are examin with the help of comprehensive world-wide data on the F2 layer. Charts showing average d turbance in the F2 region during the main phases of associated magnetic storms are present (separately for the Dst(*f*oF2) and Ds(*f*oF2) components). A detailed analysis is made of t development of individual disturbances in the Northern Hemisphere associated with some typi severe magnetic storms. *Subject Headings:* **1. F2 layer disturbances 2. Magnetic effects.**—*Fro author's abstract.*

11D–108 551.510.5

Oguti, T. and Nagata, T. (*both, Geoph. Inst., Tokyo Univ.*), **Model experiments of the screeni effect of the ionosphere.** *Tokyo Univ. Geographical Institute, Geophysical Notes*, 8(1), Contributi No. 3, June **1955.** 7 figs., 8 refs., 13 eqs. **DLC.** Reprinted from: *Japan. Science Council. Ion spheric Research Committee, Report of Ionosphere Research in Japan*, 8(4):171–184, **1954. DWB** Electromagnetic induction within a thin copper shell caused by a rapid change in external magne field is measured in order to find the screening effect of the ionosphere. In this report, some expe mental results for several cases of idealized simple distribution of electric conductivity are de with, and the result of the simplest case is compared with that of theoretical calculation. T agreement of the experiment with the theory is satisfactory. It seems therefore that this mo experiment is promising for estimating the screening effect of the ionosphere having a more compl distribution of electric conductivity. *Subject Heading:* **1. Ionospheric screening effect.**—*Autho abstract.*

11D–109 551.510.535:550.385

Olesen, Jens Kirstein (*Danish Natl. Comm. U.R.S.I.*) and Rybner, Jorgen (*Royal Danish Tech. Univ.*), **Slant Es disturbance at Godhavn and its correlation with magnetic disturbance.** *AGARDograph*, Paris, No. 34:37–57, Sept. **1958.** 17 figs., footnotes, 11 refs. **DWB** (629.1323 N864a)—This paper describes the characteristics of slant Es as observed at Godhavn, Greenland. Statistical material is presented which shows that 'slant Es condition' in the ionosphere normally occurs only during sunlit hours and only associated with a certain type of magnetic disturbance, the so-called Es disturbance. There is a close correlation between the occurrences of the two phenomena, both diurnally and seasonally. The daytime occurrence of slant Es at Godhavn is distinct from conditions at places like College, Alaska, where slant Es is a nighttime phenomenon accompanied by the occurrence of auroras. During slant Es conditions at Godhavn, reflections from the upper part of the E layer and from the F layers are always disturbed, while the D region absorption is comparatively low. Slant Es waves are usually so weak that the recorder gain setting greatly influences the distinctness with which the corresponding trace appears on the records. Certain phenomena have been found which indicate slant Es conditions in the ionosphere although no slant Es trace is visible. *Subject Headings:* **1. Magnetic-ionospheric relationships 2. Ionospheric disturbances 3. Slant Es.**—*Authors' abstract.*

11D–110 551.510.535

Penndorf, R. and Coroniti, S. C. (*both, AVCO Manuf. Co., Boston, Mass.*), **Polar Es.** *Journal of Geophysical Research*, Wash., D. C., 63(4, Pt. 1):789–802, Dec. **1958.** 10 figs., table, 10 refs. **DWB, DLC**—Data obtained by ionosondes and published by CRPL are used to investigate Es over the polar region. Three distinct types of polar Es exist, labeled Thule, Auroral Belt, and Mixed type. The Thule type, which is restricted to the area close to the geomagnetic pole (north of 73° geomag. lat.), shows a summer maximum occurring around geomagnetic noon. It follows Universal time. The Auroral Belt type occurs along the Auroral Belt and appears only at night. It follows local time. No appreciable change with season or sunspot activity is found. The Mixed type is found along the demarcation line of these two types, for example, at Baker Lake; that is, during some months the Thule type prevails, whereas in other months the Auroral Belt type prevails. Another Mixed type occurs at the southern limits of the Auroral Belt type, around 60° geomagnetic latitude. The geographic extent of each type is shown on a polar map. The strong correlation of Es and magnetic activity point to a direct or indirect influence of corpuscular radiation on the occurrence of Es in the polar region. *Subject Headings:* **1. Polar sporadic E layer (Es) 2. Polar regions.**—*Authors' abstract.*

11D–111 551.510.535(42)

Piggott, W. R. (*DSIR Radio Research Station, Slough*), **The gyro-frequency in the E-layer above Slough, England.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):197–198, Oct. **1959.** 6 refs., 2 eqs. **DWB, DLC**—Measurements of the gyrofrequency, f_H, in the E layer from the separation of foE and fxE at Slough give $f_H = 1.236 \pm 0.015$ Mc/s. The calculated value is $f_H = 1.27$ Mc/s. The difference is consistent with that found by Scott using $fo\text{E} - fz\text{E}$ measured at high latitudes. *Subject Headings:* **1. E layer gyrofrequency 2. Slough, Eng.**—*Author's abstract.* Ⓢ

11D–112 551.510.535:551.590.24

Price, W. L. (*Electrical Engin. Dept., Univ. of Sydney*), **Anomalous ionospheric reflection during solar eclipse.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):93–98, Oct. **1959.** 4 figs., 12 refs. **DWB, DLC**—The appearance of complexities in ionosonde records has been ascribed by Munro to multiple reflections from inclined isoionic surfaces. Further extension of this work by Munro and Heisler has suggested that irregularities appearing on ionosonde eclipse records and affecting consequent interpretations may be due to a similar cause. In this paper a necessary relation between height and curvature of the reflecting isoionic surface to produce complexities is deduced. It is further shown by calculating a typical set of isoionic contours for solar eclipse conditions that the necessary height curvature relation is satisfied at certain regions within the eclipse zone so that complexities can occur. *Subject Heading:* **1. Solar eclipse effects on ionosphere.**—*Author's abstract.* Ⓢ

11D–113 551.510.535:551.558(42)

Ratcliffe, J. A.; Robbins, Audrey R. and Thomas, J. O., **Movements in the quiet F-layer over Slough.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):21–26, Sept. **1959.** 2 figs., 4 refs., 4 eqs. **DLC**—Electron density profiles have been deduced from $h'(f)$ curves recorded at Slough once per hour on every day of each of six representative months. Allowance was made for the effects of the earth's magnetic field and the ionization below the F layer. The average behaviour on magnetically quiet days is described and discussed, with particular reference to the possible

magnitude and phase of vertical movements in the F-region. *Subject Headings:* **1. Ionosphe vertical movement 2. Slough, Eng.**—*Authors' abstract.* Ⓢ

11D–114 551.510.535:551.594.

Ratcliffe, J. A. (*Cavendish Lab., Cambridge*), **The highest parts of the ionosphere.** *Roy Meteorological Society, Quarterly Journal*, 85(366):321 331, Oct. **1959.** 12 figs. **DWB, DLC**— paper describing the present ideas about the highest parts of the ionosphere, above about 150 k and how views about these parts have developed in the past five years. Formerly, it was thoug that the formation process of F2 layers was the same as that of E and F1 layers; a series of 'anomali and 'unknowns' connected with F2 layer has made the old explanation entirely unsatisfacto Although no adequate explanation has yet been set forth, recently, the determinations of atmospher and electronic densities by rockets and artificial satellites, and the calculations of electron densi distributions from the $h(f)$ curves indicate that a first order solution of the problem may not be lo delayed. The way then also will be clear for a consideration of the anomalies in the F2 region, a of the fundamental changes noticeable in it during ionospheric storms. The discussion is extensive illustrated by graphical presentations. *Subject Heading:* **1. F2 layer formation.**—*I.S.* Ⓢ

11D–115 551.510.535:551.55

Ratcliffe, J. A., **Ionizations and drifts in the ionosphere.** *Journal of Geophysical Researc* Wash., D. C., 64(12):2102–2111, Dec. **1959.** 9 figs., 7 refs., 15 eqs. **DLC**—Our knowledge of th vertical distribution, and the horizontal irregularities and movements, of electrons in the ionosphe is summarized. The mechanism by which electrons can be moved either by the movement of th surrounding air or by electric fields arising from charges elsewhere in the ionosphere is discusse The statistical description of a randomly moving distribution function which is commonly used by i vestigators of the ionosphere is described. *Subject Heading:* **I. Ionospheric drift.**—*Author's abstract.*

11D–116 551.510.53

Rawer, K. (*Ionosphere Inst. Rhein, Germany*), **Correlation of Es characteristics in time an space.** *AGARDograph*, Paris, No. 34:67–80, Sept. **1958.** 11 figs., 10 refs. **DWB** (629.132 N864a)—The main parameters used to characterize an Es layer are now precisely enough defined a *fo*Es and *fb*Es. Nevertheless the values of these parameters are not representative, since heav fluctuations appear quite often. A better description can be given when the correlation function in space and time are determined. This has been done provisionally; a correlation distance of abou 200 km, and a correlation time of about 1 h for *fo*Es and ½ h for *fb*Es has been found. *Subject Heading* **1. Sporadic E layer (Es).**—*Author's abstract.*

11D–117 551.510.535:551.594.1

Rawer, K., **Hauteur et épaisseur de la couche ionosphérique E.** [Height and thickness of th ionospheric E layer.] *Annales de Géophysique*, Paris, 15(4):547–550, Oct./Dec. **1959.** 3 figs 5 refs. **DLC**—A method is presented concerning the transformation of the "virtual heights" o ionograms into true heights for the E region, by resolving the integral equation which determines th electron density distribution as a function of height. This transformation makes it possible to stud the height variations of the ionosphere. It is shown that the vertical motions in the F region may b continued in the E region. The daily variation of the maximum ionization appears clearly. Th thickness of the layer decreases with the decrease of the solar zenith distance. The minimu virtual height increases in the morning and evening; on the contrary the true height of the lowe boundary of the E layer seems to be rather little variable during the day. The author conclude that the variations of ionization may not be expressed by means of a simple continuity equation the exchange effects in the E region are not taken into account. *Subject Headings:* **1. E laye 2. Ionospheric height determination 3. Ionospheric height variations 4. Ionospheric electro density.**—*A.V.* Ⓢ

11D–118 551.510.535:551.594.1

Rees, M. H. (*Univ. Alaska, College*) and Rense, Wm. A. (*Univ. Colo. Boulder*), **Note on the caus of ionization in the F-region.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1251–125 Sept. **1959.** 2 tables, 15 refs., 7 eqs. **DLC**—Recent rocket data on the intensity of the solar 303 A HeII line at the 140 km and 212 km levels of the upper atmosphere are utilized to investigate th possibility that this radiation may be largely responsible for the heating and ionization effects in th F region. Electron densities at 140 km and at 212 km are computed on the basis that the 303.8 photons ionize oxygen atoms. The computed results compare favorably with observed values electron densities measured at these heights on ionograms taken at the same time as the rock flight which yielded the 303.8 A intensity data. *Subject Headings:* **1. F layer ionization 2. Rock ionospheric data.**—*Authors' abstract.* Ⓢ

11D–119 551.594.12:551.510.535

Renau, J. (*Cornell Univ., Ithaca, New York*), **A theory of spread F based on a scattering-screen del.** *Journal of Geophysical Research*, Wash., D. C., 64(8):971–977, Aug. **1959.** 8 figs., 10 refs., qs. **DLC**—To shed some light on the phenomenon of spread F, a thin scattering screen is postu- ed above the E region. The virtual height which is associated with a pulse radiated from the under, forward scattered by the screen and then reflected back to the sounder via the F region, is lculated. For frequencies appreciably larger than the penetration frequency, the minimum tual height versus the operating frequency, on a linear scale, is a straight line, the slope of which ends on the height of the screen. As the height of the screen increases, the slope decreases. hen the scattering screen is assumed at the level of reflection, the slope of the line coincides with the gent from the origin to the regular vertical-incidence trace. Experimental ionograms are pre- ted that fit with the suggested mechanism. *Subject Headings:* **1. Ionospheric theories 2. Spread F**—*Author's abstract.* Ⓢ

11D–120 551.594.13:551.510.535:550.388

†**Researches on the geomagnetic distortion in the ionosphere.** *Japan. Science Council. Iono- here Research Committee, Report of Ionosphere Research in Japan*, 9(2):59–104, **1955.** Contents: aeda, Hiroshi, **Observed facts of the geomagnetic distortion in the ionosphere,** p. 59–70. 6 figs., ables, 20 refs. Maeda, Ken-ichi, **Theoretical study on the geomagnetic distortion in the F2 layer,** 71–85. 6 figs., 5 tables, 18 figs., 22 eqs. Hirono, Motokazu and Maeda, Hiroshi, **Characteristics the F2 layer on the magnetic equator,** p. 86–94. 4 figs., 3 tables, 12 refs., 12 eqs. Hirono, Moto- zu, **Effect of gravity and ionization pressure gradient on the vertical drift in the F2 region,** p. 95–104. igs., table, 16 refs., 32 eqs. **DWB**—In Pt. 1, an extensive study is made on the latitude distribution id the daily variation of all ionospheric layers F2, F1 and E during the sunspot minimum period 953–1954), to examine the fact of geomagnetic distortion in the ionosphere, and the harmonic mponents of the geomagnetic Sq variations are presented, analyzed from the data of the Second olar Year. In Pt. 2, the vertical and horizontal drifts of electrons in the F2 region are studied in nnection with the geomagnetic variation and the effects of drifts on the F2 layer are treated. It is und that the geomagnetic distortion in the F2 layer can largely be interpreted by the drift. In t. 3, the direct relation between the geomagnetic Sq-variation and the vertical electron drift of the 2 region on the magnetic equator is examined. It is shown that the electric field in the F2 region companied by Sq electric current produces the vertical drift which is sufficient to interpret the ain features of the anomaly of the F2 region on the equator. It is to be noticed that the main rm of the drift velocity is diurnal. In Pt. 4, the effect of gravity and ionization pressure gradient examined in relation to the vertical drift by electrodynamic force in the F2 region. It is found at if the number density of the gas at 300 km level is not much less than 10^{10}/c.c. the semi-diurnal riation of the h_mF2 can be interpreted by drift theory. *Subject Headings:* **1. Ionospheric geo- agnetic distortion 2. Ionospheric electron drift 3. Ionospheric layers 4. Diurnal ionospheric riations 5. Vertical electron drift in F2 region. I. Maeda, Hiroshi II. Maeda, Ken-ichi I. Hirono, Motokazu.**—*Authors' abstract.*

11D–121 551.510.535:551.594.12(42)

Robbins, Audrey R. and Thomas, J. O. (*both, Cavendish Lab., Cambridge*), **The disturbed F-layer ver Slough.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):102–107, Sept. **1959.** figs., 8 refs. **DLC**—Electron density profiles for magnetically disturbed days have been compared ith those for quiet days. The effect of disturbance on the height of the peak of the F2 layer (h_mF2), n the maximum electron density (N_m) and the total electron content below the F2 layer peak (n_T), discussed. It is emphasized that the quantity h'F2 frequently used in the past in describing the ffect of disturbance is without physical significance, and can be seriously misleading. Evidence presented to show that appreciable changes sometimes occur in the ionosphere near the time of a agnetic sudden impulse. *Subject Headings:* **1. Ionospheric disturbances 2. Magnetic-ionospheric elationships 3. Slough, Eng.**—*Authors' abstract.* Ⓢ

11D–122 551.510.535:550.385

Sato, Teruo (*Geophys. Inst., Kyoto Univ.*), **Disturbances in the F2 region of the ionosphere ssociated with geomagnetic storms.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 10(2):35–48, **1956.** 9 figs., 2 tables, 9 refs., 9 eqs. **DWB**—he author examines whether the disturbed variations D_s(F2) and D_{st}(F2) in the F2 region in middle atitudes associated with geomagnetic storms are accounted for as the effect of the vertical drift of lectrons. It is considered that the vertical drift is caused by the electric field derived from the eomagnetic D_s variation, assuming that D_s current flows in the ionosphere. The velocity is cal- ulated from D_s variation for 15 storms in one season recorded at Watheroo Magnetic Observatory. s standard quiet daily variation in the F2 region, we use the variation which is obtained by taking nto consideration the vertical drift due to the electric field responsible for magnetic S_q variation.

The disturbed variations for the succeeding 72 hrs, for respective seasons, are computed by MILLIN TON'S method and compared with the corresponding variations obtained by the statistics of t ionospheric data at Watheroo for the same storms. The results show that computed D_s(F2) var tion is comparable in order of magnitude with that observed; computed D_s(F2) is greater than t computed D_{st}(F2), especially for the second and third days, while the ionospheric results show t reverse tendency; the phase difference of D_s(F2) variation for each day exists between the comput and observed values; and D_{st}(F2) variation is qualitatively analogous to the observed value. Fro these results it appears that D_s(F2) variation is approximately explained as the effect of the verti drift mentioned above. On the other hand, D_{st}(F2) variation derived from the same drift is sufficient to account for the observed D_{st}(F2) and it seems that the addition of some other effect th that considered here is necessary. *Subject Headings:* **1. Ionospheric disturbances 2. F2 lay 3. Geomagnetic storms 4. Watheroo, New Zealand.**—*Author's abstract.*

11D–123 551.510.535:550.385:550.3

†Sato, T., **Disturbances in the ionospheric F2 region associated with geomagnetic storms, Pt. Equatorial zone.** *Journal of Geomagnetism and Geoelectricity*, Tokyo, 8(4):129–135, Dec. 195 4 figs., 9 refs., 5 eqs. Also **Pt. 2, Middle latitudes.** *Ibid.*, 9(1):1–22, March **1957.** 9 figs., 3 tabl 30 refs., 9 eqs. And **Pt. 3, Auroral latitudes.** *Ibid.*, 9(2):94–106, **1957.** 7 figs., 24 refs., 9 ec **DWB**—In Pt. 1, an attempt is made to explain the ionospheric F2 disturbances on the equatori zone as the effect of the vertical drift of electrons caused by the electric field deduced from th disturbance-daily variation of the earth's magnetic field. The geomagnetic and the ionospher data are those of Huancayo on the magnetic equator. The calculations of the disturbed variatio are carried out for the individual ionospheric disturbances. The results show that the calculate variations of the disturbances using the geomagnetic data are well in accordance with the observe ionospheric data, both in the magnitudes and in the characteristics of the variations. Therefo the ionospheric F2 disturbances near the magnetic equator can be interpreted as the effect of th vertical drift of electrons. In Pt. 2, it is shown that in middle latitudes the variations of foF2 c storm days are of two types: negative and positive disturbances; the former being the same as th representative variation in high latitudes while the latter is analogous to the variation in low latitud (including the equator). On the other hand, the variations of h'F2 are analogous to those i high and low latitudes, regardless of the seasons. The results of the calculations for individu states show that two types of disturbances in middle latitudes seem to be explained as an effect the vertical drift of the electron, though the coincidence between the observed and calculated f the positive type is not sufficient. From the above results, together with the results previousl obtained for the equatorial zone, it is found that the occurrence of the positive or negative distur ances is ascribed to the conditions that the phase of the drift velocity of the electron on the quiet da is the same as that of the drift velocity on the disturbed day (negative), or the phase of the form differs from that of the latter by about 180° (positive). It is also found that the seasonal an latitudinal variations of the F2 disturbances are due to the existence of the S_q dynamo current i the ionosphere. In Pt. 3, a study is made of F2 disturbances in auroral latitudes. The process the study is analogous to that in middle and lower latitudes. The results show that F2 disturbance in the auroral latitudes, as well as those in lower ones, are ascribed to the effect of the vertical dri of electrons caused by electric field deduced from the geomagnetic disturbance-daily variation. *Subje Headings:* **1. Ionospheric disturbances 2. Magnetic effects on ionosphere 3. Magnetic equato 4. Electron vertical drift 5. F2 layer.**— *Author's abstracts.*

11D–124 551.510.53

Sato, T., **Disturbances in the F1 and E regions of the ionosphere associated with geomagnet storms.** *Journal of Geomagnetism and Geoelectricity*, Tokyo, 9(1):57–60, March **1957.** 3 figs 5 refs. **DWB**—Deviations in the F2 layer during geomagnetic storms have been well recorde since they are indicated by strong variations in the critical frequency and virtual height of the F layer. Similar disturbances occur in the F1 and E layers but they are not so apparent, since vari tions are not so great as in the F2 layer, and since they do not occur at night. Daily, seasona latitudinal and sunspot cycle variations are illustrated graphically with conclusions that the ph nomena are of similar origin in all 3 layers, and can be explained by the electron drift theory. T reason the amplitude of the variations is smaller in the F1 and E layers is because the recombinati occurs faster at lower levels, hence the drift factor is less important than in F2 layer. *Subje Headings:* **1. Ionospheric disturbances 2. F1 layer disturbances 3. E layer disturbances.**—*M.R.*

11D–125 551.510.535;550.385

Sato, T., **Ionospheric F2-disturbances associated with geomagnetic storms.** *Journal of A mospheric and Terrestrial Physics*, London, 15(1/2):116–120, Sept. **1959.** 3 figs., 2 refs., 8 eq **DLC**—An attempt is made to explain the ionospheric F2 disturbances associated with geomagnet storms by the electron drift theory. The results show that the F2-disturbances in the equatori

ne and most of disturbances in middle latitudes can be explained as the effects of the vertical drift electrons. *Subject Headings:* **1. Ionospheric disturbances 2. F layer drift 3. Magnetic-ionospheric relationships.**—*Author's abstract.* Ⓢ

11D–126 551.510.535:551.594.13

Schlapp, D. M. (*Cavendish Lab., Cambridge*), **Some measurements of collision frequency in the E region of the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):340–343 Nov. **1959.** fig., 9 refs., eq. **DWB, DLC**—Measurements of collision frequency in the E region were made by observing how the deviative absorption of a radio echo varied with its group path as a critical frequency was approached. The collision frequency at heights between 105 km and 120 km was found to vary with a scale height of about 16 km. In 1955, the collision frequency passed through a value of 2×10^4 sec^{-1} at a height of about 112 km. There is some evidence that, when the sunspot number is greater, the collision frequency at a fixed height is greater. *Subject Heading:* **Electron collision frequencies in E layer.**—*Author's abstract.* Ⓢ

11D–127 551.510.535:550.384

Schmerling, E. R. (*Ionosphere Res. Lab., Penn. State Univ.*), **An easily applied method for the reduction of h-f records to N-h profiles including the effects of the earth's magnetic field.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(1):8–16, **1958.** 7 figs., 2 tables 10 refs., 13 eqs. **DLC**—A method is presented by means of which experimental h'-f records may be readily reduced to electron-density height profiles without the use of computing aids during the final reduction process. No special assumptions are made concerning profile shapes, account is taken of the earth's magnetic field, and collisions are neglected. This method depends on sampling h' at fixed submultiples of the frequencies f_n at which true heights are required: true heights being then simply obtained by averaging these values. The sampling frequencies depend on the parameters of the earth's magnetic field, and must be compared for the magnetic coordinates of each station from which records are to be analyzed. This computation, in its entirety, is quite complex; but once performed, the results are available for use on any number of records. The method is, therefore, especially suitable for the rapid routine reduction of large numbers of records. Complete computations are presented for one station, and the results are checked against an analysis of $h'f$ curves for known geofiles. *Subject Headings:* **1. Electron density height profiles 2. Geomagnetic field.**—*Author's abstract.*

11D–128 551.507.362.1:551.510.535:551.594.12

Seddon, J. Carl (*Rocket Sonde Branch, U. S. Naval Res. Lab.*), **High electron density gradients in the ionosphere as observed with rockets.** *AGARDograph*, Paris, No. 34:171–181, Sept. **1958.** figs., 2 tables, 7 refs. **DWB** (629.1323 N864a)—Many daytime measurements of electron density profiles with rockets have been made during the condition known as "sporadic E." In all cases, it was found to be a high electron density gradient region covering in general a radius in excess of 10 km. Gradients as large as 10^6 el/cc per km have been observed. Various characteristics of sporadic E, such as horizontal variability, thickness, and maximum electron densities are briefly discussed. Evidence of many other large electron density gradients between 66 and 200 km is presented. One such gradient is always found to be present near the mesopause. The others are variable in occurrence and altitude, except for a strong tendency for E region gradients to occur at particular altitudes separated by about one scale height. One night flight at Fort Churchill, Manitoba, Canada is discussed where two sporadic E regions existed. One of these, at 98 km, had a characteristic never before observed, of the large gradient being on top side. Evidence is presented that shows that a spread F-condition existed above 190 km and that it probably consisted of many irregular, turbulent high-gradient regions. *Subject Headings:* **1. Rocket ionospheric measurements 2. Ionospheric electron density distribution 3. Fort Churchill, Manitoba.**—*Author's absiract.*

11D–129 551.501:551.510.535

Shearman, E. D. R. and Harwood, J. (*both, Radio Res. Stat. Slough, Bucks, England*), **Sporadic E as observed by backscatter techniques in the United Kingdom.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 18(1):29–42, April **1960.** 11 figs., 5 refs., eq. **DLC.** Also issued in *AGARDograph*, Paris, No. 34:111–128, Sept. **1958.** 10 figs., 4 refs. **DWB** (629.1323 N864a)—Observation of sporadic E clouds with a rotating-aerial backscatter sounder enables a greater sample of Es clouds to be studied than the use of a vertical-incidence sounder, and permits the size, location and movement of clouds to be estimated. Limitations are introduced by finite aerial beamwidth and skip-distance effect. Multifrequency operation eliminates the latter defect, and also permits ionization to be measured. Results obtained during the IGY with a single-frequency rotating-aerial sounder are presented, showing the diurnal, seasonal and geographical characteristics of Es occurrence. On particular occasions, movements have been tracked and, under favourable conditions, the size and ionization of the clouds determined. Earlier results obtained with a fixed-direction aerial

and multi-frequency technique show similar diurnal and seasonal trends, and illustrate the po bilities of the variable-frequency facility for simultaneous measurement of cloud size and ionizat *Subject Headings:* **1 Sporadic E layer (Es) observation techniques 2. Ionospheric sounding te niques.**—*Authors' abstract.*

11D–130 551.510.

Shimazaki, Tatsuo (*Radio Res. Labs., Kokubunji, Tokyo*), **Structure of the F2 layer as dedu from its daily variations.** *Japan. Radio Research Laboratories, Journal,* 3(11):17–43, Jan. 19 15 figs., 20 refs., eqs. **DWB**—The differential equations of motion and of continuity of the io spheric F2 region are solved numerically on some probable assumptions of the upper atmosph If vertical tidal drift is considered, the calculated daily variations have a strong resemblance to observed ones in all latitudes except near the equator. The observed daily variations in the ma mum electron density in the F2 layer in various latitudes and seasons may well be explained changes in the height of this critical level and in the phase of semi-diurnal vertical tidal drift veloci *Subject Headings:* **1. F2 layer variations 2. Ionosphere theories.**—*From author's abstract.*

11D–131 551.510.525:550.

Shimazaki, T., **Effect of the Sq current system on the ionospheric E- and F1-layers.** *Jour of Atmospheric and Terrestrial Physics,* London, 15(1/2):77–82, Sept. **1959.** 3 figs., 4 refs., 6 e **DLC**—The discrepancy between the observed *fo*E or *fo*F1 and those predicted by the Chapm theory is examined in detail. The result shows that the F1 layer varies in a manner more regu than the E layer, and that the discrepancy in the E layer may be attributed partly to the effect scale height gradient, but the principal cause certainly lies in the effect of Sq overhead current syste Discussion is made on the non-uniform motion of vertical drift velocity produced by this effect, well as on the recombination coefficient and the scale height gradient in these regions. *Subj Headings*: **1. Chapman theory 2. Magnetic-ionospheric relationships.**—*Author's abstract.* Ⓢ

11D–132 551.510.535:551.5

Shimazaki, Tatsuo, **Dynamical structure of the ionospheric F2-layer as deduced from the worl wide daily variations.** *Journal of Atmospheric and Terrestrial Physics,* London, 15(1/2):108–11 Sept. **1959.** 3 figs., table, 14 refs. **DLC**—Recourse was made to numerical calculations to find t effects of various nonuniform vertical motions due to diffusion, thermal and/or tidal variations daily variations in the F2 layer. A method was worked out for detecting 24 hr periodicities electron density distribution regardless of nonrecurrent motions due to several causes. The co parison of calculated and observed variations shows that the Bradbury model is better than t Chapman model in every respect. Special emphasis is placed upon the fact that the effect of no uniform semidiurnal vertical drift velocities with height gradient of both amplitude and phase very important except near the equator. *Subject Headings:* **1. F2 layer variations 2. Ionospher vertical movement.**—*Author's abstract.* Ⓢ

11D–133 551.510.535(94

†Singleton, D. G. (*Physics Dept., Univ. of Queensland, Brisbane*), **A study of "spread-F" ion spheric echoes at night at Brisbane, Pt. 3, Frequency spreading.** *Australian Journal of Physi* Melbourne, 10(1):60–76, March **1957.** 7 figs., table, 21 refs., 9 eqs. **DLC**—Virtual range vers frequency (*P'f*) records of the ionosphere made at Brisbane during 1952 and 1953 have been examine The observations are interpreted in terms of scattering from the clouds of enhanced ionization ne the F2 layer maximum which are believed to be responsible for the scintillation of radio stars. It suggested that there is a seasonal vertical movement of these clouds, the extent of which increas with latitude. *Subject Headings:* **1. Spread F 2. Brisbane, Queensland, Australia.**—*From autho abstract.*

11D–134 551.510.535:551.5

Skinner, N. J.; Hope, J. (*both, Univ. College, Ibadan, Nigeria*) and Wright, R. W. (*Univ. Coll of Ghana*), **Horizontal drift measurements in the ionosphere near the Equator.** *Nature,* Londo 182(4646):1363–1365, Nov. 15, **1958.** 2 figs. (incl. photo), table, 6 refs., eqs. **DWB**—Horizon drift in the ionospheric E and F layers have been measured regularly at Ibadan, Nigeria (magne latitude 2½°S) ever since 1957. The method used for the measurements and the results at Ibad are compared with those at Singapore and Waltair. Ibadan has larger drift velocity because of geographical position. *Subject Headings:* **1. Ionospheric drift measurements 2. Ibadan, Niger** —*N.N.*

11D–135 551.510.535:06

Slater, A. E. (*Fellow, Royal Meteorological Society*), **Conference on the physics of the ionosphe** *British Interplanetary Society, London, Journal,* 14(1):17–20, Jan./Feb. **1955. DLC**—Delega

m 17 countries, including Australia and Japan, attended this conference at Cambridge, Eng. Sept. 6–9, 1954. There are now 50 ionospheric research stations scattered around the earth, a morous account of the subjects discussed at the four sections of the conference, and the new owledge that was brought to light regarding the nature of the D, E and F regions or layers (which clearly defined according to RATCLIFFE'S notions) and the space outside the earth's atmosphere. *bject Headings:* **1. Ionospheric physics conferences 2. Ionospheric layers.**—*M.R.*

11D–136 551.510.535

Smith, Stephen J.; Burch, D. S. and Branscomb, Lewis, M. (*Natl. Bur. of Standards, Wash.*, C.), **Experimental photodetachment cross section and the ionospheric detachment rate for O_2^-.** *nnales de Géophysique*, Paris, 14(2):225–231, April/June **1958.** 4 figs., 10 refs. French and glish summaries p. 225. **DLC**—The results of measurement of the photodetachment cross tion of O_2^- are described briefly. From this cross section the photodetachment rate for O_2^- in e ionosphere is determined to be 0.44 photodetachments per ion per second. The negative ion free electron ratio is estimated for the D-layer. Some implications of the shape of the cross section ionospheric physics are discussed. *Subject Headings:* **1. Ionospheric physics 2. O_2^- photo-tachment rate 3. D layer.**—*Authors' abstract.*

11D–137 551.510.535

†Thomas, J. A., (*U. Queensland, Brisbane, Australia*), **Outline of suggested theories of sporadic E.** *GARDograph*, Paris, No. 34:23–30, Sept. **1958.** 40 refs. **DWB** (629.1323 N864a)—The various eories are briefly examined in the light of present day knowledge of sporadic E obtained by a riety of techniques. The proposals for reflection mechanisms are outlined and these are followed a short analysis of the suggested energy sources. Some comment is made on the general applica-lity of the various theories and the frequent lack of the vital connecting link between a proposed ergy source and the reflection mechanism. *Subject Heading:* **1. Sporadic E layer (Es) theories.**—*uthor's abstract.*

11D–138 551.510.535

Thomas, J. A., **Classification of sporadic E.** *AGARDograph*, Paris, No. 34:33–36, Sept. **1958.** g., ref. **DWB** (629.1323 N864a)—The various approaches to the problem of classification are scussed, and the inevitable defects of various local classifications when the problem is one of de-rmining the world-wide behaviour of sporadic E are pointed out. The present IGY Classification given, and a few comments are made on the analysis of the data so obtained. *Subject Heading:* **Sporadic E layer (Es) classification.**—*Author's abstract.*

11D–139 551.510.535:551.594.12

†Thomas, J. A. and Smith, E. K. (*Natl. Bureau of Standards, Boulder, Colo.*), **A survey of the resent knowledge of sporadic-E ionization.** *Journal of Atmospheric and Terrestrial Physics*, ondon, 13(3/4):295–314, Feb. **1959.** 2 figs., tables, bibliog., p. 310–314. **DLC**—This is a literature rvey on sporadic E reflections characterized by one or more of these: random time of occurrence, artial transparency, variation of penetration frequency or of a uniform apparent reflection height. n tabular form, the survey includes the types of zones, seasonal variation of Es, the diurnal and easonal variations of h'Es and the apparent vertical thickness of the ionization, meteor-magnetic orrelations and weather and thunderstorm correlations, as well as airglow measurements in the quatorial, temperate and auroral zones. Suggestions on subjects deserving special experimental ttention are added. *Subject Headings:* **1. Sporadic E layer (Es) ionization 2. Ionosphere bibli-graphies.**—*N.N.* Ⓢ

11D–140 551.501.7:551.510.535:551.594.13

†Thomas, J. O., **The distribution of electrons in the ionosphere.** *Institute of Radio Engineers, V. Y., Proceedings*, 47(2):162–175, Feb. **1959.** 11 figs., 4 tables, 92 refs., 15 eqs. **DLC**—This paper escribes the methods now available for calculating the distribution of electrons in the ionosphere rom observed virtual height-frequency records. Particular emphasis is given to recently developed nachine and manual methods which make it practicable to produce electron distributions on a rapid, outine basis. Attention is drawn to the importance of these data for the physics of the ionosphere y quoting from the results of some existing surveys. *Subject Heading:* **1. Ionospheric electron lensity computation.**—*Author's summary.* Ⓢ

11D–141 551.501:551.510.535

Titheridge, J. E,. (*Cavendish Lab., Cambridge*), **The calculation of real and virtual heights of eflection in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):96–109, Dec. **1959.** 3 figs., 3 tables, 8 refs., 13 eqs. **DWB, DLC**—A rapid and accurate manual method is lescribed by means of which the heights h corresponding to a given series of electron densities N can

be calculated from an ionogram which shows the $h'(f)$ curve for the ordinary or extraordinary wa
The method makes allowance for the presence of the earth's magnetic field. The virtual height
read only once at about twenty frequencies, and the calculation of a complete $N(h)$ curve requi
less than 15 min. A slightly modified method is described for use when very accurate results
required, as, for example, in a study of the fine structure of the E layer. The method makes use c
series of coefficients which may be quickly calculated once and for all, for a given place, with t
aid of a desk calculating machine. The law assumed for the shape of the segments used in t
analysis eliminates the necessity for the calculation and subsequent integration of the group
fractive index in deriving these coefficients. The coefficients for the extraordinary wave are read
obtained by applying a correction to the "longitudinal" expression for the group refractive ind
It is shown how the same coefficients can be used in the inverse process of deriving an $h'(f)$ curve fr
a known $N(h)$ curve. *Subject Heading:* **1. Ionospheric height determination.**—*Author's abstract.*

11D–142 551.501.7:551.510.535:551.594.

Titheridge, J. E., **The use of the extraordinary ray in the analysis of ionospheric record**
Journal of Atmospheric and Terrestrial Physics, N. Y., 17(1/2):110–125, Dec. **1959.** 7 figs., 3 table
4 refs., 12 eqs. **DWB, DLC**—When the ordinary ray trace on an $h'(f)$ record is used to compute
electron density profile ($N(h)$ curve) assumptions have to be made about (a) the form which t
$h'(f)$ curve would have taken at frequencies less than those actually employed, and (b) whether
not there is appreciable ionization in the "valley" between the E and F layers. In this paper it
shown how, by considering both the ordinary and the extraordinary ray traces on the $h'(f)$ recor
it is possible to avoid both these assumptions to a considerable extent, and to deduce somethi
about the electron distribution in the lower ionosphere and in any valley. The method is appli
to some experimental records, and it is shown (a) that neglect of the low-lying ionization leads to
overestimate of the height of the night-time F region ionization of about 20 km where the plasm
frequency is 2 Mc/s, and up to 15 km near the peak of the layer, and (b) that the "valley" betwe
the E and F layers is small and nearly "full." *Subject Heading:* **1. Ionospheric electron densi**
computation.—*Author's abstract.* Ⓢ

11D–143 551.501.7:551.510.535:551.594.1

Titheridge, J. E., **Ionization below the night-time F-layer.** *Journal of Atmospheric and Te*
restrial Physics, N. Y., 17(1/2):126–133, Dec. **1959.** 4 figs., 2 refs. **DWB, DLC**—By making us
of both the ordinary and extraordinary ray traces on $h'(f)$ records it is possible to estimate the amou
and distribution of low-lying ionization, having plasma frequencies less than the lowest frequenc
recorded. By applying this method to $h'(f)$ curves obtained at night, it is possible to estimate th
electron content of the E region, even when its critical frequency is less than the lowest recorde
frequency. Results are given for Slough and Watheroo for both summer and winter conditions, an
for maximum and minimum sunspot numbers. Near midnight the amount of ionization below th
F region is equivalent to a constant density of about 4000 electrons/cm^3 extending down to a heigh
of 130 km. The variation in the amount of this ionization near sunset gives a constant effectiv
recombination coefficient of 2×10^{-8} cm^3/sec. F layer heights calculated from the ordinary ra
trace only are found to be too great by about 30 km at $f_N=1$ Mc/s and 5 km at $f_N=6$ Mc/s. *Subje*
Heading: **1. Ionospheric electron density computation.**—*Author's abstract.* ⓐ

11D–144 551.510.535:551.594.12:551.507.362

Třísková, Ludmila (*Prague*), **Ionisation durch Erdsatelliten.** [Ionization by earth satellites
Beiträge zur Geophysik, Leipzig, 68(4):246–249, **1959.** 6 refs., 5 eqs. German and English sun
maries p. 246. **DWB, DLC**—It was experimentally found that frequencies higher than the MU
are reflected by the space ionized by an artificial earth satellite. The process of ionization is i
vestigated. Especially ionization by molecules accelerated by collision with the satellite is consi
ered, and this process appears probable. *Subject Heading:* **1. Ionization by satellites.**—*Autho*
summary. Ⓢ

11D–145 551.510.535:622.2:539

Utlaut, W. F., **Ionospheric effects due to nuclear explosions.** *U. S. National Bureau of Stan*
ards, NBS Report, No. 6050, April 30, **1959.** 5 p. 2 figs., 5 refs. **DWB** (621.384 U585io)
Vertical-incidence ionograms of every 15 min routine observations with a type C-2 ionosonde at t
U. S. Nat. Bur. of Standards' Field Station at Maui, Hawaii located approximately 1450 km N.
of Johnston Island are presented. The discussion deals with the extreme disturbances on Aug.
and again Aug. 12, 1958, coinciding with the high altitude nuclear explosions over Johnston Islan
Complete radio fadeouts at several South Pacific circuits, abnormal magnetic perturbations, and
rare tropical aurora (observed at Apia) are reported to be effects of the blasts. *Subject Headi*
1. Nuclear explosion effects on ionosphere.—*W.N.* Ⓢ

11D–146 551.510.535:551.594.12:551.521.11(548.1)

Venugopal, V. R. (*Kodaikanal Observ., Kodaikanal*), **Sunrise effect in the F region of the ionosphere over Kodaikanal.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(3):325–330, **1959.** fig., table, 8 refs. **DWB, DLC**—The sunrise effect in the F region of the ionosphere at Kodaikanal has been studied. It is found that the effect occurs about an hour after the moment of sunrise for visible rays in the layer and a few minutes before ground sunrise. This result is compared with those obtained at other places. The delay in the occurrence of the sunrise effect is believed to be due to the absorption of the solar ionizing radiation by the ionospheric layers lying to the east of the observing station. *Subject Headings:* **1. Sunrise effect on ionosphere 2. F layer ionization Kodaikanal, India.**—*Author's abstract.* Ⓢ

11D–147 551.510.535:550.385.4

†Vestine, E. H. (*Carnegie Inst. of Wash.*), **Observational and theoretical aspects of magnetic ionospheric storms.** *National Academy of Sciences, Wash., D. C., Proceedings*, 43(1):81–92, **1957.** 7 figs., 20 refs. **DLC**—Some of the characteristic features of magnetic and ionospheric storms and the principal theories advanced for their interpretation are reviewed. The great magnetic storm of March 24, 1940 and concurrent ionospheric changes are discussed and the latter is explained in the F region being "driven upward by the electrostatic field directed from west to east within it," allowing a separation of charge in the E region. The importance of electric field action upon the F region is confirmed by observations of F region behavior on magnetically quiet days. *Subject Headings:* **1. Magnetic-ionospheric storm relationships 2. Magnetic storms.**—*G.T.*

11D–148 551.510.535

Vickers, M. D., **The effect of the F1-layer on the calculation of the height of the F2-layer.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):103–105, Oct. **1959.** 2 figs., 3 refs., **DWB, DLC**—An approximate relationship between the estimated true height of the peak of the F2 layer and that given by assuming a single layer having a parabolic electron-density distribution is derived and compared with experimental data. *Subject Heading:* **1. Ionospheric height determination.**—*Author's abstract.* Ⓢ

11D–149 551.510.535

Watanabe, Tomiya (*Geophysical Inst. Tohoku Univ.*), **Studies on P.S.C. after the Ashour-Price's model for the ionospheric shielding effect.** *Tohoku Univ., Science Reports, 5th Series, Geophysics*, 11):11–18, Nov. **1956.** 4 figs., table, 15 refs., 8 eqs. **DWB, DLC**—Theories of pulsational sudden commencements proposed up to the present are classified into two groups: the intra-ionospheric origin theory and the extra-ionospheric origin theory. The latter seems to be more favored by the observational facts than the former. Especially, the daily behavior of the horizontal disturbing vector may be explained fairly well by the ionospheric shielding effect for the original extra-ionospheric magnetic field. *Subject Heading:* **1. Ionospheric disturbances.**—*Author's abstract.*

11D–150 551.510.535:550.385.3

Watanabe, T., **Electrodynamical behaviour and screening effect of the ionosphere.** *Tohoku University, Science Reports, Fifth Series, Geophysics*, 9(2):81–98, Oct. **1957.** 6 figs., 4 tables, 16 refs., 9 eqs. **DWB, DLC**—According to whether the fractional amount of the ionized gas relative to the neutral gas is great or small, and to whether the period concerned is short or long, an ionized gas containing neutral particles behaves as a hydromagnetic medium or as a metal-like substance. For the period of the geomagnetic pulsation, from several seconds to a few minutes, the earth's ionized outer atmosphere behaves as a hydromagnetic medium; on the other hand, the lower ionosphere shows a metal-like characteristic. Therefore, the Alfvén wave caused in the outer atmosphere will be propagated downward, and in the lower ionosphere, it will be transformed into an electromagnetic wave, which will be propagated to the earth's surface and will be observed as a geomagnetic pulsation. Because of the metal-like behavior, the lower ionosphere shows a screening effect for the downwards-coming Alfvén wave. If the ionospheric conductivity is sufficiently good, the screening effect is so strong that the observed intensity of the geomagnetic pulsation will be weakened considerably. *Subject Headings.* **1. Ionospheric screening effect 2. Geomagnetic pulsations through ionosphere.** —*Author's abstract.*

11D–151 551.510.535:551.594.12

†Waynick, Arthur H. (*Ionosphere Res. Lab., Penn. State Univ., University Pk., Pa.*), **The present state of knowledge concerning the lower ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 45(6):741–749, June **1957.** table, 78 foot-refs. **DLC.** Also issued as Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF19(604)-1304, Scientific Report, No. 90, Feb. 1, **1957.** 14 p. table, 78 refs.—In this paper an attempt is made to summarize the current state of knowledge concerning the lower ionosphere. This includes at D and lower E region heights: electron density

as functions of height and time, dissipative processes, the possible atmospheric constituents invol and their distributions, physical parameters to be considered, and solar radiations and other fac relevant in the formation of this portion of the ionosphere. Where possible, comparisons betw theory and experiment are made. *Subject Headings:* **1. Lower ionosphere 2. Ionospheric elect density 3. D layer 4. E layer.**—*Author's abstract.*

11D–152 551.510.535:

†Waynick, A. H., **Ionospheric research.** Pennsylvania. State Univ. Ionosphere Resea Laboratory, Contract AF 19(604)-1304, Final Report for Period Jan. 1, 1955 to Aug. 31, 19 Sept. 30, **1958.** 51 p. eqs.—The present statement of work is on the theoretical and experimer investigations on the physics, dynamics and general properties of the ionic layers of the eart atmosphere. Problems related to ionospheric phenomena, electromagnetic studies, solar and h atmosphere physics as well as equipment developments are discussed. The report concludes with appendix that contains abstracts of the 36 Scientific Reports issued during Jan. 1, 1955 to Aug. 1958, and a list of over 200 papers and reports issued or published in journals read at meetings, e which emanated from this project. *Subject Headings:* **1. Ionospheric research 2. Ionospho bibliographies.**—*N.N.*

11D–153 551.510.535:551.5

Weekes, K. (*Cavendish Lab., Cambridge*), **Drift of an ionized layer in the presence of the ge magnetic field.** (In: Polar Atmospheric Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. Ionospheric Section.** N. Y., Pergamon Press, **1958.** p. 12–19. 4 figs., 7 refs.) Also issued *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 2, 1957, pub. 19 p. 12–19. **DWB, DLC**—This article shows that while the neutral air moves there is both a curre flow as well as a drift of the ionization in the plasma which is superposed on the original air movemer The irregularity that is observed in this layer may be moved by wind in the neutral gas or by applied electric field. When a comparison of the relative efficiencies of these two cases is to be ma we also have to compare the velocities of drift resulting from a wind of velocity C_0 and from an electr field $E=C_{0x}B$, where B is the steady magnetic field. The velocity components of such an irregul drift are relative to the air. If there is a wind C_0, contributing $E_1=C_0B$ to E the velocity relati to any fixed observer is $(V-C_0)$. It is shown that in some areas of the F layer, drifts are caused b electric fields due to polarization changes; in the E region they are caused both by wind and b electrical field changes; while in the D region wind alone is the effective factor. *Subject Headin* **1. Ionospheric drift.**—*N.N.*

11D–154 551.510.53

Weekes, K., **Evidence about Es from N(h) profiles.** *AGARDograph*, Paris, No. 34:149, Sep **1958. DWB** (629.1323 N864a)—Two points are made in this note, one about the classification of E types by virtual heights, and the other about the shape of the E layer in the presence of Es. It found that the virtual height of the Es trace may be determined mainly by the gradient of the $N($ curve near the Es, and not by the actual height of the Es layer. On one occasion it was observe that, during an Es condition, a distortion was observed in the E layer which might explain the condition by a redistribution process. *Subject Heading:* **1. Sporadic E layer (Es).**—*Author's abstra*

11D–155 551.510.535(75

Wells, H. W. (*Carnegie Inst. of Wash., Dept. of Terrestrial Magn.*), **Large-scale movements the layers.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 2, Ionospher Section,** N. Y. Pergamon Press, **1958.** p. 33–40. 12 figs.) Also issued in *Journal of Atmospher and Terrestrial Physics*, London, Special Supplement, Pt. 2, 1957, pub. **1958.** p. 33–40. **DW DLC**—Various charts and figures are presented to illustrate the typical cloudlike surge in *fo*F2 ar its variations. The back-scatter records at different points near Washington, D. C. are include as well as the graphs of critical frequencies for various stations spaced 150–200 km or more in Mar land, Virginia and West Virginia. The results of this work are based on analysis of both the ordina and the extraordinary wave components as shown on the velocity-vector-wavelength compone charts, December 1952. Arrows show the magnitude and direction of drift motions at each significa height. *Subject Headings:* **1. foF2 variations 2. F layer critical frequencies 3. Washington, D.** —*N.N.*

11D–156 551.501.7:551.510.5

Wright, J. W. and Norton, R. B. (*both, Natl. Bureau of Standards, Boulder, Colo.*), **Analysis ionospheric vertical soundings for electron density profile data, Pt. 1, Facilities for convenie manual reduction of ionograms.** *U. S. National Bureau of Standards, Technical Note*, No. 14, Ju **1959.** 8 p. 4 figs., 4 refs. **DWB** (M(055) U585te). Wright, J. W., **Analysis of ionosphe vertical soundings for electron density profile data, Pt. 2, Extrapolation of observed electron densi**

ofiles above $h_{max}F2$. *Ibid.*, No. 19, June **1959.** 8 p. 2 figs., 8 eqs. **DWB** (M(055) U585te)—Pt. 1, facilities for manual reduction of ionospheric vertical soundings to true heights are prepared ng the "10 point" ratios of VENTRICE and SCHMERLING. A study of the effects of the earth's gnetic field on true height calculations permits selection of five sets of these ratios assuring equal curacy of application for any part of the world. The facilities available are in the form of transrent overlays and matching special graph paper. In Pt. 2, a tentative model of the F region above ax is provided to permit extrapolation of electron density profiles into this region. The model responds to a simple "Chapman" curve, and may be fitted to true height data (obtained in Pt. I) a simple graphical process. *Subject Headings:* **1. Ionospheric data analysis 2. Ionospheric ctron density determination.**—*Authors' abstract.* Ⓢ

11D–157 551.510.535

Wright, J. W., **A model of the F-region above $h_{max}F2$.** *Journal of Geophysical Research*, Wash., C., 65(1):185–191, Jan. **1960.** 6 figs., table, 13 refs., 4 eqs. **DWB, DLC**—A simple Chapman odel (scale height 100 km) of the ionosphere above the peak of the F region is found to be in good reement with the few observed profiles of this region. The ratio of the above-peak electron content plied by the model to below-peak electron content is found to vary from about 2.8 to 4.0, also in od agreement with observations. The model is used in conjunction with electron density profiles served from the ground to construct meridional cross sections along the 75°W geographic meridian. *ubject Headings:* **1. F layer 2. Ionospheric models.**—*Author's abstract.* Ⓢ

11D–158 551.510.535:551.543:523.3

Wright, R. W. (*Univ. College of Ghana*) and Skinner, N. J. (*Univ. College, Ibadan, Nigeria*), **inar tides in the sporadic E-layer at Ibadan.** *Journal of Atmospheric and Terrestrial Physics*, ondon, 13(3/4):217–221, Feb. **1959.** 4 figs., 2 tables, 6 refs. **DLC**—An analysis of the lunar semiurnal tides in *f*Es and *h'*Es is made for Ibadan. The results are presented in the form of harmonic als. Comparisons are made between these results and those of other stations. *Subject Headings:* **Lunar semidiurnal tides in Es 2. Ionospheric tides 3. Ibadan, Nigeria.**—*Authors' abstract.* Ⓢ

11D–159 551.510.535(213)

Wright, R. W. and Skinner, N. J. (*both, Univ. College, Ibadan, Nigeria*), **Equatorial spread-F.** *ournal of Atmospheric and Terrestrial Physics*, London, 15(1/2):121–125, Sept. **1959.** fig., 2 tables, refs. **DLC**—Spread-F conditions have been examined for six low-latitude stations—Dakar, hartoum, Djibouti, Ibadan, Nairobi and Leopoldville. It is shown that, contrary to the general iew, occurrence of disturbed magnetic conditions inhibits the occurrence of spread-F layers during ne southern solstice at all these stations. The seasonal variation of the occurrence of spread-F is onsiderably changed if, instead of all days, only magnetically quiet days are considered. In the orthern winter there appears to be widespread correlation of occurrence of spread-F across Africa. his is shown to be due to the magnetic influence. *Subject Headings:* **1. Equatorial ionosphere . Spread F.**—*Authors' abstract.* Ⓢ

11D–160 551.510.535:551.594.13

Yonezawa, Toshiyuki (*Radio Res. Labs., Kokubunji, Tokyo*), **A new theory of formation of the 2-layer.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):89–94, Sept. **1959.** figs., 6 refs., 10 eqs. **DLC**—The importance is emphasized of the role played by electron-ion iffusion in the mechanism of formation of the F2 layer. Taking into account the electron-ion iffusion in the gravitational field as well as the electron-ion movement in the vertical direction, the elocity of which is assumed to increase exponentially with height, height distributions of electron lensity for steady-state conditions have been calculated and are discussed. The latitudinal disributions of the maximum electron density and the height of its level have also been obtained and ompared with observations, resulting in a reasonable agreement at least in their broad features. *Subject Headings:* **1. F2 layer formation 2. Ionospheric electron diffusion.**—*Author's abstract.* Ⓢ

11D–161 551.510.535:551.594.12

Yonezawa, T., **New theory of the formation of the F2 layer.** *Japan. Radio Research Laboratories, Journal*, 3(11):1 16, Jan. **1956.** 5 figs., 21 refs., 23 eqs. **DWB**—A new theory is proposed to the effect that in the lower portion of the F2 layer the height distribution of electron density is determined by electron removal due to its dissociative recombination with molecular ions of oxygen generated by the atom-ion interchange reaction between atomic ions and neutral molecules of oxygen, while in the upper portion it is determined by electron-ion diffusion in the earth's gravitational field, the maximum being produced at an intermediate height by both processes. The theoretical variations of the maximum electron density and of its height with latitude conform with observations fairly well except near the equator. The low-density (and low-temperature) model of the atmosphere based on rocket data seems to be preferable to the older model. The agreement with observations

will become more satisfactory if electron-ion diffusion in the horizontal direction as well as the elec fields in the upper atmosphere and perhaps temperature effect are taken into consideration. *Sub Headings:* **1. F2 layer formation 2. Ionosphere theories.**—*From author's abstract.*

11D–162 551.510.535:550..

Zmuda, Alfred J. (*Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.*), **So characteristics of the upper-air magnetic field and ionospheric currents.** *Journal of Geophys Research*, Wash., D. C., 65(1):69–84, Jan. **1960.** 3 figs., 5 tables, 25 refs., 9 eqs. **DWB, DL** Characteristics of the upper-air magnetic field and ionospheric currents are determined through analysis of published rocket data on the magnetic scalar intensity. For the region between earth's surface and the E layer of the ionosphere, the observed values are compared with val obtained by extrapolating the surface vector field. The agreement between the two sets of val is very good for equatorial flights but only fair for a flight at White Sands, New Mexico. T equatorial, ionospheric current density, which has a maximum of about 21 amp/km², varies co siderably with time and location of the rocket flight. The equatorial electrojet has a current intens of about 130 amp/km² and flows practically along the magnetic equator. Some of the comput currents associated with the normal magnetic daily variation are at variance with those expect from considerations, such as harmonic analysis, of the surface transient field and sheet-curre approximations. In the area around White Sands (geomagnetic latitude 41°N) a large negati magnetic anomaly exists that may contribute to the formation of the region of low intensity radiation that lies between the two Van Allen radiation belts. *Subject Headings:* **1. Ionosphe currents 2. Magnetic-ionospheric relationships 3. Rocket magnetic measurements.**—*Autho abstract.* Ⓢ

ART III. TRANSLATIONS, RECENT MONOGRAPHS, AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological and Geoastrophysical Abstracts.**

A. TRANSLATIONS

ademiia Nauk SSSR: **The other side of the moon.** Translated from the Russian by J. B. Sykes. London, Pergamon Press, 1960(?). Price 10 sh 6d.

SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG: **International Geophysical Year bibliography of literature in the Russian language for 1958.** Transl. from the compilation made under the . . . Interdepartmental Committee for the Conduct of the IGY, Moscow, 1959. This transl. issued as *U. S. National Aeronautics and Space Administration, Technical Translation* F-12, May 1960. 75 p. 616 refs. Titles of articles and monographs in English. Journal sources and imprints in original language. "Continuation of the Bibliography of Literature in the Russian Language for 1954–1956." (*For abstract on latter title, see* 10.9–76, Sept. 1959, *MAB*)

pert, Ia. L. and Aĭnberg, A. A.: **On the statistical nature of the ionosphere.** (Transl. of original Russian in *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 21(8):389–400, 1951.) Transl. available Special Libraries Association, John Crerar Library, Chicago.

pert, Ia. L. and Fligel', D. S.: **The synthesis of forms of atmospherics and the effective parameters of the lower part of the ionosphere on low frequencies.** (Transl. of original Russian in *Radiotekhnika i Elektronika* (USSR), 4(2):202--, 1959.) Transl. available Special Libraries Association.

rgun, K. I.: **Determination of the altitude of clouds from an airplane.** (Transl. of original Russian in *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 12:49–55, 1953) Transl. available Special Libraries Association.

rkov, V. A.: **Hydrologie de la région Iles du Commandeur-Kamtchatka en période de printemps.** (Transl. of original Russian, **K gidrologii Komandoro-Kamchatskogo raiona Tikhogo Okeana v vesennee vremia** [Hydrology of the Komandoro-Kamchatka region of the Pacific Ocean in spring] in *Akademiia Nauk SSSR. Institut Okeanologii, Trudy*, 27:12–21, 1958. 8 figs.) French transl. issued in *France. Comité Central d'Océanographie et d'Etudes des Côtes, Cahiers Océanographiques*, 11(9):633–643, 1959. Available DWB.

naplygin, E. I.: **New models of oceanographic apparatus.** (Transl. of original Russian, **Novye obraztsy nekotorykh okeanograficheskikh priborov,** in *Problemy Arktiki*, Leningrad, No. 3:106–108, 1958.) Transl. issued as *Canada Defense Research Board, Translation* T-327-R.

eriagin, B. V. and Todes, O. M.: **A theory of the movement of droplets in an anabatic current of air subsaturated or supersaturated with vapor and its possible meteorological applications.** (Transl. of original Russian in *Akademiia Nauk, SSSR, Doklady*, 62(1):93–96, 1948.) Transl. available Special Libraries Association. Micro. $1.80 Photostat $1.80.

u Castel, F.; Misme, P. and Voge, J.: **Reflection of an electromagnetic wave from an atmospheric layer with a variation of the index of refraction.** (Transl. of original French, **Réflexion d'une onde électromagnétique par une couche d'atmosphère présentant une variation de l'indice de réfraction,** in *Académie des Sciences, Paris, Comptes Rendus*, 246(12):1838–1840, March 24, 1958.) Transl. available Special Libraries Association.

zerdzeevskiĭ, B. L.: **Possibilities of changing the climatic conditions of the Caspian Region.** (Transl. of original Russian, **Puti preobrazovaniia klimaticheskikh usloviĭ Prikaspiia** in *Akademiia Nauk SSSR, Izvestiia, Ser. Geograf.*, No. 1:3–13, 1952.) Transl. available Special Libraries Association. (*For abstract on original Russian, see* 6.6–126, June 1955, *MAB*)

pinat'ev, M. N.: **Fog diagnosis and forecast.** (Transl. of original Russian, **K voprosu o diagnoze i prognoze tumana** in *Meteorologiia i Gidrologiia*, Leningrad, No. 6: 25–29, 1958) Transl. available Office of Technical Services, Price $0.50.

Fel'dshteĭn, Ia. I.: **Geographic distribution of aurora in the western part of the Soviet Arc** (Transl. of original Russian, **Geograficheskoe raspredelenie poliarnykh siianiĭ v zapadnoĭ cha Sovetskoĭ Arktiki** in *Problemy Arktiki*, Leningrad, No. 4:45–49, 1958) Transl. available *Canada. Defence Research Board, Translation* T-329-R.

Fedorov, E. K.: **Investigation of the upper layers of the atmosphere by means of rockets and artifi satellites.** (Transl. of original Russian, **Issledovaniia verkhnikh sloev atmosfery pri pomoschi raket i iskusstvennykh sputnikov zemli,** in *Priroda*, Moscow, 46(9):3–12, 1957) Transl. availa Special Libraries Association. Micro $2.70. Photostat $4.80.

B. RECENT MONOGRAPHS

Bell, Thelma Harrington: **Thunderstorm.** Illus. by Corydon Bell. N. Y., Viking Press, 19 128 p.

Bollinger, Clyde J.: **Atlas (1900–1959) of planetary solar climate with sun-tide indices of solar rad tion and global insolation.** 1st ed. Norman, Okla., Battenburg Press, 1960. 121 p. D (QC883.B66)

Emery, K. O.: **Sea off Southern California: a modern habitat of petroleum.** N. Y., Wiley, 19 266 p. figs. Price $12.50. Review by Preston E. Cloud in *Science*, Wash., D. C., 131(340 1212, April 22, 1960.

Fourmarier, P.: **Hydrogéologie** [Hydrogeology]. 2d ed. Paris, Masson, 1958. 294 p. 164 ill Price 3000 FF.

Georgii, Walter: **Meteorologische Navigation des Segelfluges** [Meteorological navigation of glider Brunswick, Vieweg, 1959. 135 p.

Hess, Seymour L.: **Introduction to theoretical meteorology.** N. Y., Henry Holt, 1959. 362 numerous figs., tables, foot-refs. and eqs. DWB

Hinze, J. O.: **Turbulence: an introduction to its mechanism and theory.** N. Y., McGraw-Hill, 19 506 p. Illus. Price $15.00. Review by S. J. Kline in *Science*, Wash., D. C., 131(3408):12 April 22, 1960.

Jackson, ; Moreland, et al.: **Vision in military aviation.** *U. S. Air Force. Wright velopment Center, Institute for Applied Experimental Psychology*, [*Publication*] PB151653, 19 Available from OTS, U. S. Dept. of Commerce, Wash., D. C., Price $5.00.

Margat, Jean: **Bibliographie hydrogéologique du Maroc, 1905–1957** [Hydrogeological bibliograp of Morocco, 1905–1957]. Rabat, Editions du Service Géologique du Maroc, 1958. 63 p.

Nisbit, Paul H.; Pond, Alonzo W. and Allen, William H.: **The survival book.** Princeton, N. J., V Nostrand Co., 1959. 338 p. figs. Price $7.50. bibliog. Review by George W. Baker *Science*, 131(3408):1211, April 22, 1960.

Ozenda, Paul: **Flore du Sahara septentrional et central** [Flora of the northern and central Sahara Paris, Centre National de la Recherche Scientifique, 1958. 488 p. 16 plates.

Pawson, H. Cecil: **Cockle Park Farm.** London, Oxford Univ. Press, 1960. 261 p. 19 illus., plates and graphs, 25 tables. Price 35 sh. Review in *Royal Meteorological Society, Quarte Journal*, 86(368):292, April 1960.

Schoeller, H.: **Arid zone hydrology: recent developments.** *UNESCO, Arid Zone Research*, Vol. 1959(?). 105 p. 220 refs. Review in *Arid Zone*, Paris, No. 4:18, June 1959. Review *Royal Meteorological Society, Quarterly Journal*, 86(368):291, April 1960.

Schweinfurth, Ulrich: **Die horizontale und vertikale Verbreitung der Vegetation im Himala** [Horizontal and vertical distribution of vegetation in the Himalaya]. *Bonner Geographis Abhandlungen*, No. 20, (pub. Bonn, Ferd. Dümmler). 1957. 372 p. Price 27 DM. Revi by N. L. Bor in *Geographical Journal*, London, 124(4):550, Dec. 1958.

U. S. Corps of Engineers: **Snow hydrology.** 1959. 437 p. 21 tables, 72 plates. Price $8. Review in *Royal Meteorological Society, Quarterly Journal*, 86(368):291, April 1960.

Vilaplana Soler, Ricardo: **Meteorología náutica** [Nautical meteorology]. Barcelona, Editor Juventud, 1958. 224 p. illus. DLC (QC994.V5)

Whitten, Charles A. and Drummond, Kenneth H. (*eds.*): **Contemporary geodesy.** *American G physical Union, Geophysical Monograph*, No. 4, 1959. 709 p. Price $5.50 (*National Resea Council, Publication* No. 708) "Proceedings of a Conference held at Harvard College Observato Smithsonian Astrophysical Obs., Cambridge, Dec. 1–2, 1958."

Zimmerschied, Wilhelm: **Dreidimensionale Analyse und meteorologische Navigation** [Three- mensional analysis and meteorological navigation]. Frankfurt a. M., Akademische Verla gesellschaft M.B.H., 1959. 154 p. 77 figs. (Vol. 2 of *Luftfahrt-Meteorologie*, ed. by H. Reg and W. Zimmerschied)

C. ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

...demiia Nauk SSSR, Izvestiia, Ser. Geog., No. 6, Nov./Dec. 1959

Kats, N. Ia.: **Termicheskaia volna pozdnego pleĭstotsena i razvitie rastitel'nosti,** [Warm wave of the late Pleistocene and the development of vegetation], p. 77–81

Ivanov, Iu. A. and Tareev, B. A.: **K voprosu o strukture zony antarkticheskoĭ divergentsii,** [Structure of the zone of Antarctic divergence], p. 82–89

Beklemishev, K. V.: **Antarkticheskaia divergentsiia i polia pitaniia kitov,** [Antarctic divergence and feeding grounds of whales], p. 90–93.

Spiridonova, Iu. V.: **Smeshchenie estestvennykh sinopticheskikh raĭonov Severnogo polushariia,** [Displacement of natural synoptic regions of the Northern Hemisphere], p. 94–97

Bass, S. V.: **Issledovanie protsessov formirovaniia vesennego stoka na sklonakh v lesnoĭ zone,** [Investigation of spring runoff formation processes on slopes in forest regions], p. 98–102

...ademiia Nauk SSSR. Morskoĭ Gidrofizicheskiĭ Institut, Trudy, Vol. 13, 1958

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